U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
PB80-131592

EPA Utility FGD Survey
July-September 1979

PEDCo-Environmental, Inc, Cincinnati, OH

Prepared for

Industrial Environmental Reseach Lab, Research Triangle Park, NC

Oct 79

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/7-79-022f	2.	3. RECIPIENT'S ACCESSION NO. PB 80 131592
4. TITLE AND SUBTITLE EPA Utility FGD Survey: July -September 1979		5. REPORT DATE October 1979
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) M. Smith and M. Melia		8. PERFORMING ORGANIZATION REPORT NO. PN 3470-1-C
9. PERFORMING ORGANIZATION NAME AND ADDRESS PEDCo Environmental, Inc. 11499 Chester Road Cincinnati, Ohio 45246		10. PROGRAM ELEMENT NO. EHE624
		11. CONTRACT/GRANT NO. 68-01-4147, Task 79
12. SPONSORING AGENCY NAME AND ADDRESS EPA, Office of Research and Development Industrial Environmental Research Laboratory Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Quarterly; 7-9/79
		14. SPONSORING AGENCY CODE EPA/600/13

15. SUPPLEMENTARY NOTES EPA project officers are N. Kaplan (IERL-RTP, MD-61, 919/541-2556) and J.D. Herlihy (DSSE, 202/755-8137). EPA-600/7-79-022c through -022e are previous reports in this series.

16. ABSTRACT The report is the last of three supplements updating the December 1978-January 1979 report (EPA-600/7-79-022c) and should be used in conjunction with it. The report was generated by a new computerized data base system and differs from those of the previous series in that the scope of design data for operating FGD systems is vastly expanded, section formats are revised somewhat, and a new section includes operational particulate scrubbers. The report gives a survey of utility flue gas desulfurization (FGD) systems in the U.S. It summarizes information contributed by the utility industry, process suppliers, regulatory agencies, and consulting engineering firms. Systems are tabulated alphabetically by development status (operational, under construction, or in planning stages), utility company, process supplier, process, and waste disposal practice. It presents data on boiler design, FGD system design, fuel characteristics, and actual performance. It includes unit by unit dependability parameters and discusses problems and solutions associated with the boilers and the FGD systems. Process flow diagrams and FGD system economic data are appended to the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution	Maintenance	Pollution Control	13B
Flue Gases		Stationary Sources	21B
Desulfurization		Utility Boilers	07A, 07D
Electric Utilities			
Waste Disposal			15E
Boilers			13A

18. DISTRIBUTION STATEMENT Release to Public	19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 270
	20. SECURITY CLASS (This page) Unclassified	22. PRICE A12 - A01

EPA Form 2220-1 (9-73)

United States
Environmental Protection
Agency

Industrial Environmental Research
Laboratory
Research Triangle Park NC 27711

EPA-600/7-79-022f
October 1979

PB80-131592

EPA Utility FGD Survey: July-September 1979

Interagency Energy/Environment R&D Program Report

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

RESEARCH REPORTING SERIES

Research reports of the Office of Research and Development, U.S. Environmental Protection Agency, have been grouped into nine series. These nine broad categories were established to facilitate further development and application of environmental technology. Elimination of traditional grouping was consciously planned to foster technology transfer and a maximum interface in related fields. The nine series are:

1. Environmental Health Effects Research
2. Environmental Protection Technology
3. Ecological Research
4. Environmental Monitoring
5. Socioeconomic Environmental Studies
6. Scientific and Technical Assessment Reports (STAR)
7. Interagency Energy-Environment Research and Development
8. "Special" Reports
9. Miscellaneous Reports

This report has been assigned to the INTERAGENCY ENERGY-ENVIRONMENT RESEARCH AND DEVELOPMENT series. Reports in this series result from the effort funded under the 17-agency Federal Energy/Environment Research and Development Program. These studies relate to EPA's mission to protect the public health and welfare from adverse effects of pollutants associated with energy systems. The goal of the Program is to assure the rapid development of domestic energy supplies in an environmentally-compatible manner by providing the necessary environmental data and control technology. Investigations include analyses of the transport of energy-related pollutants and their health and ecological effects; assessments of, and development of, control technologies for energy systems; and integrated assessments of a wide range of energy-related environmental issues.

EPA REVIEW NOTICE

This report has been reviewed by the participating Federal Agencies, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Government, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

EPA-600/7-79-022f
October 1979

EPA Utility FGD Survey: July-September 1979

by

M. Smith and M. Melia

PEDCo Environmental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

Contract No. 68-01-4147
Task No. 79
Program Element No. EHE624

EPA Project Officers:

N. Kaplan
Industrial Environmental Research Laboratory
Office of Environmental Engineering and Technology
Research Triangle Park, NC 27711

J.C. Herlihy
Division of Stationary Source Enforcement
Office of Enforcement
Washington, D.C. 20460

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Research and Development
Washington, DC 20460

NOTICE

The report, (prepared by PEDCo Environmental, Inc., Cincinnati, Ohio, under EPA Contract No. 68-01-4147, Task No. 113) is provided as an information transfer document. Data in this report are supplied voluntarily by utility representatives; flue gas desulfurization (FGD) system designers, and suppliers; regulatory personnel; and others. Neither EPA nor the designated contractor warrants the accuracy or completeness of information contained in this report.

This report is the third of three supplementary issues to the December 1978 - January 1979 report. Supplementary issues are cumulative, so that it is necessary to retain only the latest issue and the December 1978 - January 1979 report (EPA-600/7-79-022c).

Initial distribution of the report (generally, one copy per company) is limited to organizations and individuals indicating a specific interest in the field of FGD technology. Additional copies of this report and succeeding issues can be purchased from National Technical Information Service, Springfield, Virginia 22151.

CONTENTS

Page

Notice ii
Tables vii
Executive Summary and Highlights viii

Section 1 Summary List of FGD Systems 1

Section 2 Status of FGD Systems 6

Section 3 Design and Performance Data for Operational FGD Systems 33

Alabama Electric
  Tombigbee 2 33
  Tombigbee 3 35
Allegheny Power System
  Pleasants 1 38
Arizona Electric Power
  Apache 2 40
  Apache 3 42
Arizona Public Service
  Cholla 1 44
  Cholla 2 46
Central Illinois Light
  Duck Creek 1 48
Central Illinois Public Service
  Newton 1 52
Columbus and Southern Ohio Electric
  Conesville 5 54
  Conesville 6 56
Cooperative Power Association
  Coal Creek 1 58
Duquesne Light
  Elrama 1-4 60
  Phillips 1-6 63
Indianapolis Power and Light
  Petersburg 3 66
Kansas City Power and Light
  Hawthorn 3 68
  Hawthorn 4 70
  LaCygne 1 72

CONTENTS (continued)

Page

Kansas Power and Light
Jeffrey 1 75
Lawrence 4 77
Lawrence 5 79
Kentucky Utilities
Green River 1-3 81
Louisville Gas and Electric
Cane Run 4 83
Cane Run 5 85
Cane Run 6 87
Mill Creek 3 90
Paddy's Run 6 92
Minnkota Power Cooperative
Milton R. Young 2 94
Montana Power
Colstrip 1 97
Colstrip 2 99
Nevada Power
Reid Gardner 1 101
Reid Gardner 2 103
Reid Gardner 3 106
Northern Indiana Public Service
Dean H. Mitchell 11 108
Northern States Power
Sherburne 1 110
Sherburne 2 112
Pennsylvania Power
Bruce Mansfield 1 114
Bruce Mansfield 2 116
Philadelphia Electric
Eddystone 1A 118
Public Service Company of New Mexico
San Juan 1 120
San Juan 2 122
South Carolina Public Service Authority
Winyah 2 124
South Mississippi Electric
R.D. Morrow 1 126
R.D. Morrow 2 128
Southern Illinois Power Coop
Marion 4 130
Southern Indiana Gas and Electric
A.B. Brown 1 132
Springfield City Utilities
Southwest 1 135
Tennessee Valley Authority
Shawnee 10A 138
Shawnee 10B 139
Widows Creek 8 142

CONTENTS (continued)

Page

Texas Utilities

Martin Lake 1 144
Martin Lake 2 146
Martin Lake 3 148
Monticello 3 151

Utah Power and Light

Hunter 1 153
Huntington 1 155

Section 4 Summary of FGD Systems by Company 157

Section 5 Summary of FGD Systems by System Supplier 158

Section 6 Summary of FGD Systems by Process 160

Section 7 Summary of Operating FGD Systems by Process and Unit 161

Section 8 Summary of End-Product Disposal Practices for Operational FGD Systems 163

Section 9 Summary of FGD Systems in Operation 165

Section 10 Summary of FGD Systems Under Construction 168

Section 11 Summary of Contract Awarded FGD Systems 170

Section 12 Summary of Planned FGD Systems 171

Section 13 Total FGD Units and Capacity (MW) Installed by Year 173

Section 14 Design and Performance Data for Operational Particulate Scrubbers 174

Appendix A FGD System Cost Data: Operational and Nonoperational Systems A-1

A-1 Major FGD System Equipment Summary A-8
A-2 Cost Element Factors A-13
A-3 Description of Cost A-16
A-4 Categorical Results of Reported and Adjusted Capital and Annual Costs for Operational FGD Systems A-19
A-5 Costs for Operational FGD Systems A-20
A-6 Costs for Nonoperational FGD Systems A-24

Appendix B FGD Process Flow Diagrams B-1

CONTENTS (continued)

Page

Appendix C Definitions C-1

Appendix D Glossary of Units D-1

TABLES

No. Page

I Number and Total Capacity of FGD Systems viii

II Summary of Changes, Third Quarter 1979 x

III Performance of Operational Units, Third Quarter 1979 xi

EXECUTIVE SUMMARY

This report is prepared quarterly (every three months) by PEDCo Environmental, Inc., under contract to the Industrial Environmental Research Laboratory/Research Triangle Park and the Division of Stationary Source Enforcement of the U.S. Environmental Protection Agency. It is generated by a computerized data base system, the structure of which is illustrated in Figure 1.

Table 1 summarizes the status of FGD systems in the United States at the end of September 1979. Table II lists the units that have changed status during the third quarter 1979, and Table III shows the performance of operating units during this period.

TABLE 1. NUMBER AND TOTAL CAPACITY OF FGD SYSTEMS

Status	No. of units	Total Controlled Capacity, MW*	Equivalent Scrubbed Capacity, MW†
Operational	56	21,104	19,387
Under construction	42	18,485	17,250
Planned:			
Contract awarded	19	9,713	9,415
Letter of intent	0		
Requesting/evaluating bids	18	13,033	12,183
Considering only FGD systems	26	14,000	13,930
TOTAL	161	76,335	72,165

* Total Controlled Capacity (TCC) is the summation of the gross unit capacities (MW) brought into compliance with FGD systems regardless of the percent of the flue gas scrubbed by the FGD system(s).

† Equivalent Scrubbed Capacity (ESC) is the summation of the effective scrubbed flue gas in equivalent MW based on the percent of the flue gas scrubbed by the FGD system(s).

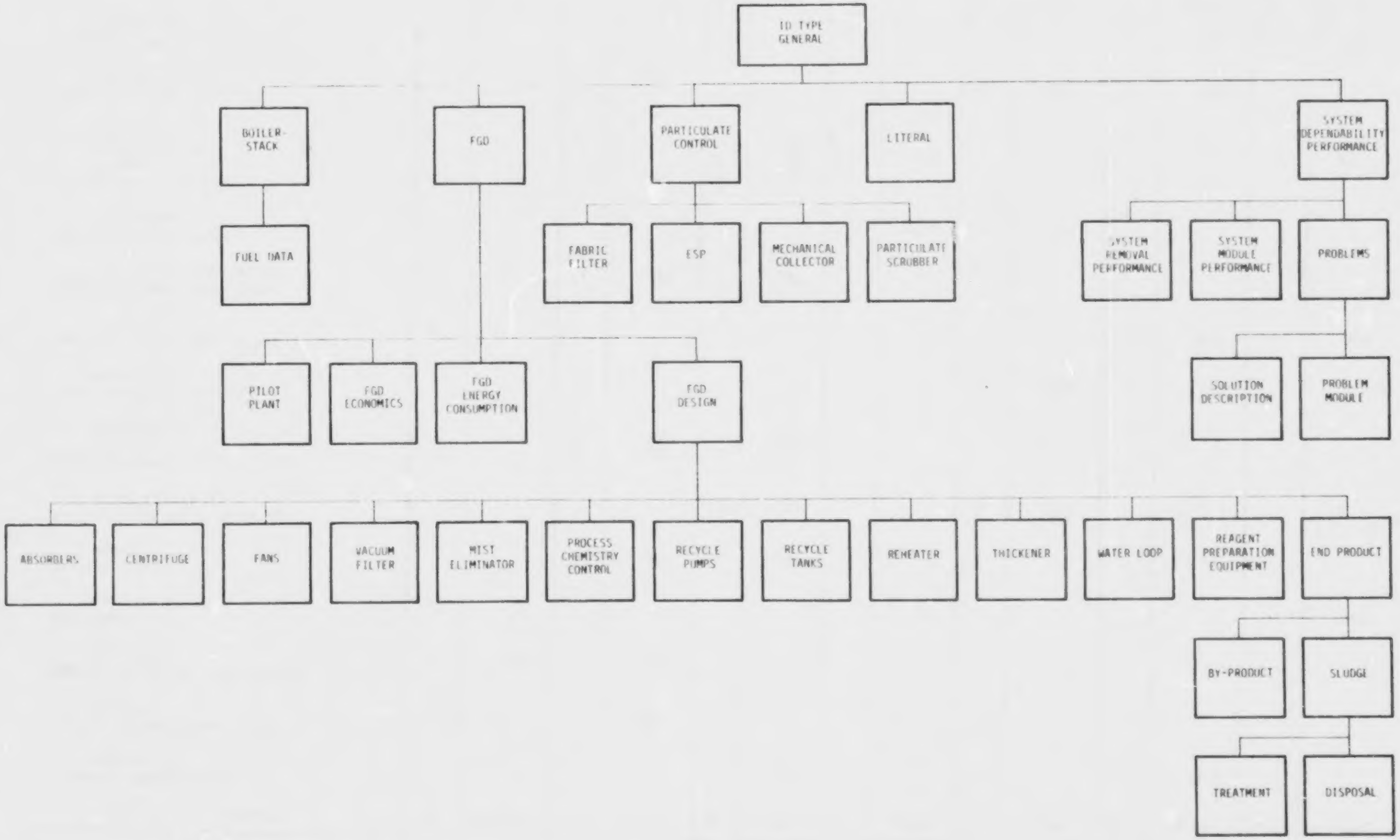

ID TYPE GENERAL
BOILER-STACK
FGD
PARTICULATE CONTROL
LITERAL
SYSTEM DEPENDABILITY PERFORMANCE
FUEL DATA
FABRIC FILTER
ESP
MECHANICAL COLLECTOR
PARTICULATE SCRUBBER
SYSTEM REMOVAL PERFORMANCE
SYSTEM MODULE PERFORMANCE
PROBLEMS
PILOT PLANT
FGD ECONOMICS
FGD ENERGY CONSUMPTION
FGD DESIGN
SOLUTION DESCRIPTION
PROBLEM MODULE
ABSORBERS
CENTRIFUGE
FANS
VACUUM FILTER
MIST ELIMINATOR
PROCESS CHEMISTRY CONTROL
RECYCLE PUMPS
RECYCLE TANKS
REHEATER
THICKENER
WATER LOOP
REAGENT PREPARATION EQUIPMENT
END PRODUCT
BY-PRODUCT
SLUDGE
TREATMENT
DISPOSAL

Figure 1. Computerized data base structure diagram.

TABLE II. SUMMARY OF CHANGES: FGD SUMMARY REPORT
THIRD QUARTER 1979

FGD status report	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*
6/30/79	55	18,466[a]	42	17,135	16	8,938	2	1,100	16	11,200	31	15,079[a]	162	71,918[a]
Allegheny Power System Mitchell 3					+1	300					-1	300		
Central Illinois Public Serv. Newton 1	+1	617	-1	617										
Cooperative Power Association Coal Creek 1	+1	327	-1	327										
Gulf Power Scholz 1,2	-1	23											-1	23
Hoosier Energy Merom 1			-1	441	+1	441								
Houston Lighting & Power Co. W. A. Parish 8					+1	512			-1	512				
Montana Power														
Colstrip 3			+1	700	-1	700								
Colstrip 4			+1	700	-1	700								
Muscatine Power & Light Muscatine 9									+1	160	-1	160		
New York State Elec. & Gas Somerset											+1	870	+1	870
Niagara Mohawk Power Coop. Charles R. Huntley 66			+1	100	-1	100								
Northern States Power Sherburne 3							-1	860	+1	860				
Philadelphia Electric														
Cromby					+1	150					-1	150		
Eddystone 1B					+1	240	-1	240						
Eddystone 2					+1	334					-1	334		
Tampa Electric Big Bend 4									+1	475	-1	475		
Tennessee Valley Authority Cumberland											-1	600	-1	600
TOTAL	56	19,387	42	17,250	19	9,415	0		18	12,183	26	13,930	161	72,165

* Equivalent scrubbed capacity.

[a] This value was modified slightly due to an MW correction.

TABLE III. PERFORMANCE OF OPERATIONAL UNITS
THIRD QUARTER 1979

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD capacity on line during period, MW[a,b]	No information for this period, MW	Shut down throughout period, MW	JULY 1979 Dependability[c,e]				AUGUST 1979 Dependability[c,e]				SEPTEMBER 1979 Dependability[c,e]			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Tombigbee 2	179	70	179			93	91	91	72	99	92	92	70	100	93	93	76
Tombigbee 3	179	70	179			72	28	28	11	99	64	64	42	100	75	75	14
Pleasants 1	519	83	519														
Apache 2	195	100	195														
Apache 3	195	100	195														
Cholla 1	119	100	119														
Cholla 2	350	100	350														
Duck Creek 1	378	90	378			95	87	96	61	13	17	23	12	65	57	65	53
Newton 1	617	100	617														
Conesville 5	411	100		411													
Conesville 6	411	100		411													
Coal Creek 1	327	60	327														
Elrama 1-4	510	100	510				88		80		88		80				
Phillips 1-6	410	100	410				92		73		92		70				
Petersburg 3	532	100		532													
Hawthorn 3	90	100	90			100				75				84			
Hawthorn 4	90	100	90			93				100				69			
La Cygne 1	874	100	874							94				96			
Jeffrey 1	540	75	540														
Lawrence 4	125	100	125														
Lawrence 5	420	100	420														
Green River 1-3	64	100	64			100			0	100			0	100			0
Cane Run 4	188	100	188				99		93		89		89		0		0
Cane Run 5	190	100	190				72		56		88		73		84		54
Cane Run 6	288	100	288				0		0		7		7		60		44
Mill Creek 3	442	100	442				60		55		68		50		90		84
Paddy's Run 6	72	100	72				0		0		45		13		0		0
Milton R. Young 2	405	92	405			44	44	44	44	39	39	39	39	23	23	23	23
Colstrip 1	360	100	360														
Colstrip 2	360	100	360														
Reid Gardner 1	125	100	125			81	81	81	80	96	97	97	97	100	100	100	53
Reid Gardner 2	125	100	125			86	91	86	78	93	99	93	93	85	84	82	66
Reid Gardner 3	125	100	125			93	93	93	93	87	93	88	88	100	99	100	90
Dean H. Mitchell 11	115	100	115			90		82	79								
Sherburne 1	740	100	740			93				95				92			
Sherburne 2	740	100	740			95				96				95			
Bruce Mansfield 1	917	100	917														
Bruce Mansfield 2	917	100	917														
Eddystone 1A	120	N/A[d]		120													
San Juan 1	361	100	361														
San Juan 2	350	100	350														
Winyah 2	140	50	140			98	98	98	98	99	99	99	98				
R.D. Morrow 1	124	62	124														
R.D. Morrow 2	124	62	124											4	5	5	5
Marion 4	184	100		184													
A.B. Brown 1	265	100	265				63		55		94		94		75		74
Southwest 1	194	100	194			57	41	41	41	84	62	62	59	71	59	66	47
Shawnee 10A	10	N/A[d]	10														
Shawnee 10B	10	N/A[d]	10														
Widows Creek 8	550	100	550			100	100		41	97	100		75	97	100		71
Martin Lake 1	595	75	595														
Martin Lake 2	595	75	595														
Martin Lake 3	595	75	595														
Monticello 3	800	100	800														
Hunter 1	360	90	360				100		99		100		100		100		100
Huntington 1	366	85	366				80		80		30		27		55		54
Total			17,729	1,658	0												

---

[a] Equivalent scrubbed capacity.

[b] This category includes the flue gas capacity being handled by the FGD system at least part of the time during the report period.

[c] The percent figures listed are average values for all system scrubbing trains during the period.

[d] Flue gas % scrubbed for prototype and demonstration units is not applicable unless the system is designed to bring a unit into compliance with SO_2 emission standards.

[e] Availability, operability, reliability, and utilization as defined in Appendix C of this report.

As indicated in Table 1, 56 power generating units (all coal-fired) are now equipped with operating FGD systems. These units represent a total controlled capacity of 21,104 MW. Current projections indicate that the total power generating capacity of the U.S. electric utility industry will be approximately 931 GW by 1990.[a] (This value reflects the annual loss resulting from the retirement of older units, which is considered to be 0.4 percent of the average generating capacity at the end of each year.[b]) Approximately 382 GW or 41 percent of the 1990 total will come from coal-fired units. The distribution of power generation sources, both present (April 1979) and future (January 1990) is as follows:[a]

	Coal	Nuclear	Oil	Hydro	Gas	Other	GW (total)
April 1979	39%	9%	26%	12%	13%	1%	588
January 1990	41%	22%	18%	10%	8%	1%	931

Based on the known commitments to FGD by utilities as presented in Table 1, the percentage of electrical generating capacity controlled by FGD for both the present (September 1979) and the future (January 1990) is as follows:

	% of coal-fired generating capacity	% of total generating capacity
September 1979	9.2	3.6
January 1990	20.0	8.2

In light of the revised New Source Performance Standards, actual FGD control is expected to be greater than what is reflected by the figures above. For example, about 55 to 60 systems representing approximately 36,000 to 41,000 MW of generating capacity presently fall tc the uncommitted category. These are systems that cannot be included in the committed group at this time because information regarding their status is not ready for public release.

HIGHLIGHTS: THIRD QUARTER 1979

The following paragraphs highlight FGD system developments during the third quarter, 1979.

Tombigbee 2 of Alabama Electric Coop achieved FGD system availabilities of 93%, 99% and 100% for July, August and September, respectively. Tombigbee 3 demonstrated FGD system availabilities of 99% and 100% for August and September. No major problems were reported during the period.

A contract was awarded by Allegheny Power System during the third quarter 1979 for a lime slurry FGD system to be installed by Chemico on Mitchell 33. Initial startup of the FGD system is scheduled for August 1982. The Mitchell 33 unit is a 300 MW (gross) boiler that fires bituminous coal with an average sulfur content of 2.8%.

Duck Creek 1 of Central Illinois Light operated through July with an FGD system availability of 95%. The unit encountered some recycle pump failures and mist eliminator plugging.

Initial FGD operations began during the period at the Newton 1 unit of Central Illinois Public Service. Although flue gas has been passed through the individual modules for testing purposes, integrated operation of the FGD system is not expected to begin until December 1979. This dual alkali system was supplied by Buell/Envirotech and consists of four tray tower absorbers preceded by a cold-side ESP for primary particulate matter control. Also included are two thickeners, two experimental reheat systems, and three horizontal extraction filters for sludge dewatering.

Coal Creek 1 of Cooperative Power Association began shakedown/debugging operations during the report period. Particulate matter is removed from the flue gas generated by the unit with cold side ESP's and SO_2 is controlled by four parallel spray towers circulating a lime/alkaline fly ash slurry. Approximately 40% of the flue gas is bypassed for reheat and the sludge is disposed in a clay-lined pond.

Chiyoda International announced that all testing of the CT-121 process at the Scholz Power Plant of Gulf Power has been completed. The EPRI studies that were being conducted were officially terminated late in June after a total of 4,448 hours of operation had been logged. During this time, the jet bubbling reactor was off line for 123 hours with an average six-month availability of 99.5%.

Houston Lighting and Power announced during the period that a contract has been awarded to Chemico for the installation of an emission control system on the 600 MW (net) W. A. Parish 8 unit. The system will consist of three spray drying towers utilizing limestone as the reagent. Each tower will be designed for 85% SO_2 removal. Also included will be a chevron type mist eliminator and reheat will be provided by an 18% bypass system.

At LaCygne 1 of Kansas City Power and Light, average FGD system availabilities of 94% and 96% were reported for the months of August and September, respectively. No major problems occurred during these two months. The unit was out of service during July for a turbine overhaul.

Louisville Gas and Electric reported operabilities of 99% and 89% during July and August, respectively for Cane Run 4. Mill Creek 3 achieved a 90% operability in September. Cane Run 4 experienced some damper problems and Mill Creek 3 had reheater failures during the report period.

Montana Power has announced that construction began during the third quarter at the Colstrip Power Station on the lime/alkaline fly ash FGD systems that are being installed on Boilers 3 and 4. These units are being supplied by ADL/Combustion Equipment Associates and are scheduled to begin commercial operation in January 1984 and the Fall of 1984 for units 3 and 4 respectively. Each boiler is rated at 700 MW (gross) and fires coal with an average sulfur content of 0.7%.

Muscatine Power and Water reported that bids are being evaluated for the FGD facility planned for Muscatine 9. The FGD system will consist of two lime or limestone slurry SO_2 absorbers, an indirect steam coil reheater and a forced oxidation system that will produce a stable waste for landfill when dewatered. Muscatine 9 is expected to begin operations in September 1982.

Nevada Power reported that the FGD systems at Reid Gardner 1, 2, and 3 were in service for most of the third quarter 1979. FGD system availabilities for July, August and September were 81%, 96% and 100%, respectively, for Unit 1. Unit 2 availabilities were 86%, 93%, and 85% with Unit 3 availabilities being 93%, 87% and 100%, respectively, for July, August and September.

New York Electric and Gas announced plans to install a limestone slurry FGD system on the utility's new 850 MW Somerset 1 steam generator scheduled for service in 1984. Particulate matter generated by the pulverized coal furnace will be removed by a cold side ESP. The FGD facility design will include a direct hot air injection reheat system to boost the saturated gas temperature before entering the 450 ft stack. FGD waste from this closed loop system will be dewatered and stabilized before being landfilled.

Construction at Charles R. Huntly 66 of Niagara Mohawk Power began in September. The demonstration aqueous carbonate FGD system to be retrofilled onto this unit will produce sulfur as an end product. Particulate matter is removed from the flue gas by mechanical collectors and an ESP upstream of the FGD system. The Charles R. Huntly 66 FGD System is expected to begin operations in April 1982.

Although data were not available for the months of August and September, Northern Indiana Public Service reported that the availability of the Dean H. Mitchell 11 scrubber was 90% for the month of July. FGD outage resulted from inspection of the booster blower speed reducer and a high flow resistance in the SO_2 reduction unit.

Northern States Power has announced that bids were again reopened for the emission control system that is to be installed at Sherburne 3 due to developments in the latest FGD technology. Sherburne 3 is a 860 MW (gross) unit that fires coal with an average sulfur content of 0.8%. FGD operations are tentatively scheduled to begin at this unit in mid-1984.

At Sherburne 1 of Northern States Power, the FGD system had availabilities of 93%, 95%, and 92%, respectively, for July, August and September. No major operational problems were reported for the three-month period. The unit went off-line on September 8 for an annual boiler/turbine inspection and is expected to restart during the last week of October. The Sherburne 2 FGD system availabilities were 95%, 96% and 95% for July, August and September, respectively. No operational problems have been reported for this unit since it restarted in June after the annual boiler turbine inspection.

Philadelphia Electric announced during the third quarter that contracts have been awarded to United Engineers for the installation of a magnesium oxide FGD system to treat the balance of the flue gas from Eddystone 1 and for a system to treat the flue gas from the 334 MW (gross) Eddystone 2 unit. A contract was also awarded to United Engineers for a third magnesium oxide FGD system to be installed on one of two boilers at the Cromby power station. The initial startup of all three systems is tentatively scheduled for mid-1980.

South Carolina Public Service reports that the Winyah 2 FGD system had availabilities of 98% and 99% for the months of July and August, respectively. In July minor problems were reported with nozzle plugging and the quencher pump packing. The only unscheduled outage in August was a result of booster fan control problems.

The recently operational dual alkali system at the A.B. Brown station of Southern Indiana Gas and Electric had an availability of 94% during the month of August. The only major problem reported during this month was a forced outage due to problems with the recycle pump impellers.

Tampa Electric is now requesting/evaluating bids for the Big Bend 4 FGD installation. The utility is considering a lime or limestone FGD system with direct hot air injection reheat and an ESP for particulate matter control. Big Bend 4 is scheduled to begin operations in March 1985.

Plans to install an emission control system at the Cumberland Power Station of Tennessee Valley Authority were cancelled during the period. Although initial indications were that an FGD system would have to be installed, further testing at this unit revealed that emissions were within the appropriate state and federal standards and an emission control system would not therefore be necessary.

Tennessee Valley Authority reported July and August FGD system availabilities of 100% and 99%, respectively, for the Widows Creek 8 unit. The only operational problems reported for the two-month period were corrosion of the carbon steel reheat tubes and ball mill outage time due to broken flange bolts.

REFERENCES

a. U.S. Department of Energy. Energy Information Administration. Office of Energy Data Interpretation. Division of Coal Power Statistics. Inventory of Power Plants in the United States, April 1979. Pub. No. DOE/EIA-0095.

b. Rittenhouse, R.C. New Generating Capacity: When, Where and By Whom. Power Engineering 82(4):57. April 1978.

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
ALABAMA ELECTRIC COOP						
TOMBIGBEE	2	LEROY	ALABAMA	9/78	1	A
TOMBIGBEE	3	LEROY	ALABAMA	6/79	1	A
ALLEGHENY POWER SYSTEM						
MITCHELL	33	COURTNEY	PENNSYLVANIA	8/82	3	B
PLEASANTS	1	BELMONT	WEST VIRGINIA	3/79	1	A
PLEASANTS	2	BELMONT	WEST VIRGINIA	9/80	2	A
ARIZONA ELECTRIC POWER COOP						
APACHE	2	COCHISE	ARIZONA	8/78	1	B
APACHE	3	COCHISE	ARIZONA	6/79	1	B
ARIZONA PUBLIC SERVICE						
CHOLLA	1	JOSEPH CITY	ARIZONA	10/73	1	B
CHOLLA	2	JOSEPH CITY	ARIZONA	4/78	1	B
CHOLLA	4	JOSEPH CITY	ARIZONA	6/80	2	B
FOUR CORNERS	1	FARMINGTON	NEW MEXICO	0/79	2	B
FOUR CORNERS	2	FARMINGTON	NEW MEXICO	0/79	2	B
FOUR CORNERS	3	FARMINGTON	NEW MEXICO	0/79	2	B
FOUR CORNERS	4	FARMINGTON	NEW MEXICO	0/82	3	B
FOUR CORNERS	5	FARMINGTON	NEW MEXICO	0/82	3	B
ASSOCIATED ELECTRIC COOP						
THOMAS HILL	3	MOBERLY	MISSOURI	1/82	2	A
BASIN ELECTRIC POWER COOP						
ANTELOPE VALLEY	1	BEULAH	NORTH DAKOTA	11/81	3	B
ANTELOPE VALLEY	2	BEULAH	NORTH DAKOTA	11/83	6	B
LARAMIE RIVER	1	WHEATLAND	WYOMING	4/80	2	A
LARAMIE RIVER	2	WHEATLAND	WYOMING	10/80	2	A
LARAMIE RIVER	3	WHEATLAND	WYOMING	7/81	3	A
BIG RIVERS ELECTRIC						
GREEN	1	SEBREE	KENTUCKY	10/79	2	A
GREEN	2	SEBREE	KENTUCKY	6/80	2	A
CENTRAL ILLINOIS LIGHT						
DUCK CREEK	1	CANTON	ILLINOIS	9/76	1	A
DUCK CREEK	2	CANTON	ILLINOIS	1/84	5	A
CENTRAL ILLINOIS PUBLIC SERV						
NEWTON	1	NEWTON	ILLINOIS	9/79	1	A
CENTRAL MAINE POWER						
SEARS ISLAND	1	PENOBSCOT BAY	MAINE	11/87	6	A
CINCINNATI GAS & ELECTRIC						
EAST BEND	2	RABBITHASH	KENTUCKY	10/81	2	A
COLORADO UTE ELECTRIC ASSN.						
CRAIG	1	CRAIG	COLORADO	1/80	2	B
CRAIG	2	CRAIG	COLORADO	8/79	2	B
COLUMBUS & SOUTHERN OHIO ELEC.						
CONESVILLE	5	CONESVILLE	OHIO	1/77	1	B
CONESVILLE	6	CONESVILLE	OHIO	6/78	1	B
POSTON	5	ATHENS	OHIO	0/83	6	B
POSTON	6	ATHENS	OHIO	0/89	6	B

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
5. PLANNED - REQUESTING/EVALUATING BIDS
6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. BOILER CONSTRUCTED SUBJECT TO FEDERAL NSPS
B. BOILER SUBJECT TO STATE STANDARD THAT IS MORE STRINGENT THAN THE FEDERAL NSPS
C. BOILER SUBJECT TO STATE STANDARD THAT IS EQUAL TO OR LESS STRINGENT THAN NSPS
D. OTHER
E. REGULATORY CLASS UNKNOWN

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
COMMONWEALTH EDISON						
POWERTON	51	PERKIN	ILLINOIS	11/79	2	C
COOPERATIVE POWER ASSOCIATION						
COAL CREEK	1	UNDERWOOD	NORTH DAKOTA	8/79	1	A
COAL CREEK	2	UNDERWOOD	NORTH DAKOTA	10/80	2	A
DELMARVA POWER & LIGHT						
DELAWARE CITY	1-3	DELAWARE CITY	DELAWARE	4/80	2	C
DUQUESNE LIGHT						
ELRAMA	1-4	ELRAMA	PENNSYLVANIA	10/75	1	B
PHILLIPS	1-6	SOUTH HEIGHT	PENNSYLVANIA	7/73	1	B
EAST KENTUCKY POWER COOP						
SPURLOCK	2	MAYSVILLE	KENTUCKY	10/80	2	A
GENERAL PUBLIC UTILITIES						
COHO	1	ERIE	PENNSYLVANIA	12/88	6	A
SEWARD	7	SEWARD	PENNSYLVANIA	12/87	6	A
HOOSIER ENERGY						
MEROM	1	SULLIVAN	INDIANA	4/81	3	A
MEROM	2	SULLIVAN	INDIANA	1/82	2	A
HOUSTON LIGHTING & POWER CO.						
W.A. PARISH	8	THOMPSONS	TEXAS	11/82	3	A
INDIANAPOLIS POWER & LIGHT						
PETERSBURG	3	PETERSBURG	INDIANA	12/77	1	A
PETERSBURG	4	PETERSBURG	INDIANA	10/83	2	A
KANSAS CITY POWER & LIGHT						
HAWTHORN	3	KANSAS CITY	MISSOURI	11/72	1	B
HAWTHORN	4	KANSAS CITY	MISSOURI	8/72	1	B
LA CYGNE	1	LA CYGNE	KANSAS	2/73	1	C
KANSAS POWER & LIGHT						
JEFFREY	1	WAMEGO	KANSAS	8/78	1	B
JEFFREY	2	WAMEGO	KANSAS	6/80	2	B
LAWRENCE	4	LAWRENCE	KANSAS	1/76	1	B
LAWRENCE	5	LAWRENCE	KANSAS	11/71	1	B
KENTUCKY UTILITIES						
GREEN RIVER	1-3	CENTRAL CITY	KENTUCKY	9/75	1	C
LAKELAND UTILITIES						
MCINTOSH	3	LAKELAND	FLORIDA	10/81	3	A
LOUISVILLE GAS & ELECTRIC						
CANE RUN	4	LOUISVILLE	KENTUCKY	8/76	1	A
CANE RUN	5	LOUISVILLE	KENTUCKY	12/77	1	A
CANE RUN	6	LOUISVILLE	KENTUCKY	4/79	1	A
MILL CREEK	1	LOUISVILLE	KENTUCKY	4/81	2	B
MILL CREEK	2	LOUISVILLE	KENTUCKY	4/82	2	B
MILL CREEK	3	LOUISVILLE	KENTUCKY	8/78	1	B
MILL CREEK	4	LOUISVILLE	KENTUCKY	7/81	2	B
PADDY'S RUN	6	LOUISVILLE	KENTUCKY	4/73	1	C
TRIMBLE COUNTY	1	BEDFORD	KENTUCKY	7/84	6	D
TRIMBLE COUNTY	2	BEDFORD	KENTUCKY	7/86	6	D

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
5. PLANNED - REQUESTING/EVALUATING BIDS
6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. BOILER CONSTRUCTED SUBJECT TO FEDERAL NSPS
B. BOILER SUBJECT TO STATE STANDARD THAT IS MORE STRINGENT THAN THE FEDERAL NSPS
C. BOILER SUBJECT TO STATE STANDARD THAT IS EQUAL TO OR LESS STRINGENT THAN NSPS
D. OTHER
E. REGULATORY CLASS UNKNOWN

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
MIDDLE SOUTH UTILITIES						
ARKANSAS COAL	5		ARKANSAS	1/86	5	D
ARKANSAS COAL	6		ARKANSAS	1/88	5	D
LOUISIANA COAL	1		LOUISIANA	0/86	5	D
LOUISIANA COAL	2		LOUISIANA	0/88	5	D
MISSISSIPPI COAL	1		MISSISSIPPI	0/85	5	D
MISSISSIPPI COAL	2		MISSISSIPPI	0/87	5	D
MINNESOTA POWER & LIGHT						
CLAY BOSWELL	4	COHASSET	MINNESOTA	2/80	2	A
MINNKOTA POWER COOPERATIVE						
MILTON R. YOUNG	2	CENTER	NORTH DAKOTA	9/77	1	B
MONTANA POWER						
COLSTRIP	1	COLSTRIP	MONTANA	9/75	1	A
COLSTRIP	2	COLSTRIP	MONTANA	5/76	1	A
COLSTRIP	3	COLSTRIP	MONTANA	1/84	2	B
COLSTRIP	4	COLSTRIP	MONTANA	0/84	2	B
MUSCATINE POWER & WATER						
MUSCATINE	9	MUSCATINE	IOWA	9/82	5	A
NEVADA POWER						
HARRY ALLEN	1	N.E. LAS VEGAS	NEVADA	6/86	6	A
HARRY ALLEN	2	N.E. LAS VEGAS	NEVADA	6/87	6	A
HARRY ALLEN	3	N.E. LAS VEGAS	NEVADA	6/88	6	A
HARRY ALLEN	4	N.E. LAS VEGAS	NEVADA	6/89	6	A
REID GARDNER	1	MOAPA	NEVADA	4/74	1	A
REID GARDNER	2	MOAPA	NEVADA	4/74	1	A
REID GARDNER	3	MOAPA	NEVADA	6/76	1	A
REID GARDNER	4	MOAPA	NEVADA	0/83	6	A
WARNER VALLEY	1	ST. GEORGE	UTAH	6/85	6	A
WARNER VALLEY	2	ST. GEORGE	UTAH	6/86	6	A
NEW ENGLAND ELECTRIC SYSTEM						
BRAYTON POINT	3	SOMERSET	MASSACHUSETTS	0/ 0	7	C
NEW YORK STATE ELEC & GAS						
SOMERSET	1	SOMERSET	NEW YORK	6/84	6	B
NIAGARA MOHAWK POWER COOP						
CHARLES R. HUNTLEY	66	BUFFALO	NEW YORK	4/82	2	C
NORTHERN INDIANA PUB SERVICE						
BAILLY	7	CHESTERTON	INDIANA	0/ 0	6	C
BAILLY	8	CHESTERTON	INDIANA	0/ 0	6	C
DEAN H. MITCHELL	11	GARY	INDIANA	7/76	1	C
SCHAHFER	17	WHEATFIELD	INDIANA	6/83	5	A
SCHAHFER	18	WHEATFIELD	INDIANA	6/85	5	A
NORTHERN STATES POWER						
SHERBURNE	1	BECKER	MINNESOTA	3/76	1	B
SHERBURNE	2	BECKER	MINNESOTA	4/77	1	B
SHERBURNE	3	BECKER	MINNESOTA	5/84	5	B
OTTER TAIL POWER						
COYOTE	1	BEULAH	NORTH DAKOTA	3/81	2	B

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
5. PLANNED - REQUESTING/EVALUATING BIDS
6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. BOILER CONSTRUCTED SUBJECT TO FEDERAL NSPS
B. BOILER SUBJECT TO STATE STANDARD THAT IS MORE STRINGENT THAN THE FEDERAL NSPS
C. BOILER SUBJECT TO STATE STANDARD THAT IS EQUAL TO OR LESS STRINGENT THAN NSPS
D. OTHER
E. REGULATORY CLASS UNKNOWN

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
PACIFIC GAS & ELECTRIC						
MONTEZUMA	1	COLLINSVILLE	CALIFORNIA	6/86	6	B
MONTEZUMA	2	COLLINSVILLE	CALIFORNIA	6/87	6	B
PACIFIC POWER & LIGHT						
JIM BRIDGER	4	ROCK SPRINGS	WYOMING	9/79	2	B
PENNSYLVANIA POWER						
BRUCE MANSFIELD	1	SHIPPINGPORT	PENNSYLVANIA	12/75	1	B
BRUCE MANSFIELD	2	SHIPPINGPORT	PENNSYLVANIA	7/77	1	B
BRUCE MANSFIELD	3	SHIPPINGPORT	PENNSYLVANIA	5/80	2	B
PHILADELPHIA ELECTRIC						
CROMBY		PHOENIXVILLE	PENNSYLVANIA	6/80	3	B
EDDYSTONE	1A	EDDYSTONE	PENNSYLVANIA	9/75	1	B
EDDYSTONE	1B	EDDYSTONE	PENNSYLVANIA	6/80	3	B
EDDYSTONE	2	EDDYSTONE	PENNSYLVANIA	6/80	3	B
POTOMAC ELECTRIC POWER						
DICKERSON	4	DICKERSON	MARYLAND	0/87	6	D
POWER AUTHORITY OF NEW YORK						
ARTHUR KILL		STATEN ISLAND	NEW YORK	11/87	6	B
PUBLIC SERVICE OF INDIANA						
GIBSON	5	PRINCETON	INDIANA	0/82	3	A
PUBLIC SERVICE OF NEW MEXICO						
SAN JUAN	1	WATERFLOW	NEW MEXICO	4/78	1	B
SAN JUAN	2	WATERFLOW	NEW MEXICO	8/78	1	B
SAN JUAN	3	WATERFLOW	NEW MEXICO	12/79	2	B
SAN JUAN	4	WATERFLOW	NEW MEXICO	1/82	2	B
SALT RIVER PROJECT						
CORONADO	1	ST. JOHNS	ARIZONA	11/79	2	B
CORONADO	2	ST. JOHNS	ARIZONA	1/80	2	B
CORONADO	3	ST. JOHNS	ARIZONA	0/84	6	B
SAN MIGUEL ELECTRIC COOP						
SAN MIGUEL	1	SAN MIGUEL	TEXAS	7/80	2	A
SEMINOLE ELECTRIC						
SEMINOLE	1	PALATKA	FLORIDA	6/83	5	A
SEMINOLE	2	PALATKA	FLORIDA	6/85	5	A
SIKESTON BOARD OF MUNIC. UTIL.						
SIKESTON	1	SIKESTON	MISSOURI	1/81	2	A
SOUTH CAROLINA PUBLIC SERVICE						
WINYAH	2	GEORGETOWN	SOUTH CAROLINA	7/77	1	A
WINYAH	3	GEORGETOWN	SOUTH CAROLINA	5/80	2	A
WINYAH	4	GEORGETOWN	SOUTH CAROLINA	5/81	3	A
SOUTH MISSISSIPPI ELEC PWR						
R.D. MORROW	1	HATTISBURG	MISSISSIPPI	8/78	1	A
R.D. MORROW	2	HATTISBURG	MISSISSIPPI	6/79	1	A
SOUTHERN ILLINOIS POWER COOP						
MARION	4	MARION	ILLINOIS	5/79	1	A
MARION	5	MARION	ILLINOIS	0/84	6	A

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
5. PLANNED - REQUESTING/EVALUATING BIDS
6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. BOILER CONSTRUCTED SUBJECT TO FEDERAL NSPS
B. BOILER SUBJECT TO STATE STANDARD THAT IS MORE STRINGENT THAN THE FEDERAL NSPS
C. BOILER SUBJECT TO STATE STANDARD THAT IS EQUAL TO OR LESS STRINGENT THAN NSPS
D. OTHER
E. REGULATORY CLASS UNKNOWN

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
SOUTHERN INDIANA GAS & ELEC						
A.B. BROWN	1	WEST FRANKLIN	INDIANA	3/79	1	A
SOUTHWESTERN ELECTRIC POWER						
HENRY W. PERKEY	1	HALLSVILLE	TEXAS	12/83	3	A
SPRINGFIELD CITY UTILITIES						
SOUTHWEST	1	SPRINGFIELD	MISSOURI	4/77	1	A
SPRINGFIELD WATER, LIGHT & PWR						
DALLMAN	3	SPRINGFIELD	ILLINOIS	7/80	2	A
ST. JOE ZINC						
G.F. WEATON	1	MONACA	PENNSYLVANIA	11/79	2	B
TAMPA ELECTRIC						
BIG BEND	4	TAMPA	FLORIDA	3/85	5	A
TENNESSEE VALLEY AUTHORITY						
JOHNSONVILLE	1-10	NEW JOHNSONVILL	TENNESSEE	0/82	5	C
PARADISE	1	PARADISE	KENTUCKY	6/82	3	C
PARADISE	2	PARADISE	KENTUCKY	3/82	3	C
SHAWNEE	10A	PADUCAH	KENTUCKY	4/72	1	C
SHAWNEE	10B	PADUCAH	KENTUCKY	4/72	1	C
WIDOWS CREEK	7	BRIDGEPORT	ALABAMA	10/80	2	C
WIDOWS CREEK	8	BRIDGEPORT	ALABAMA	5/77	1	C
TEXAS MUNICIPAL POWER AGENCY						
GIBBONS CREEK	1	CARLOS	TEXAS	1/82	3	A
TEXAS POWER & LIGHT						
SANDOW	4	ROCKDALE	TEXAS	7/80	2	A
TWIN OAKS	1	BREMOND	TEXAS	8/84	5	A
TWIN OAKS	2	BREMOND	TEXAS	8/85	5	A
TEXAS UTILITIES						
FOREST GROVE	1	ATHENS	TEXAS	0/81	5	A
MARTIN LAKE	1	TATUM	TEXAS	4/77	1	A
MARTIN LAKE	2	TATUM	TEXAS	5/78	1	A
MARTIN LAKE	3	TATUM	TEXAS	2/79	1	A
MARTIN LAKE	4	TATUM	TEXAS	0/85	3	A
MILL CREEK	1	HENDERSON	TEXAS	0/85	6	D
MILL CREEK	2	HENDERSON	TEXAS	0/86	6	D
MONTICELLO	3	MT. PLEASANT	TEXAS	5/78	1	A
UTAH POWER & LIGHT						
HUNTER	1	CASTLE DALE	UTAH	5/79	1	A
HUNTER	2	CASTLE DALE	UTAH	6/80	2	A
HUNTINGTON	1	PRICE	UTAH	5/78	1	A
WISCONSIN POWER & LIGHT						
COLUMBIA	2	PORTAGE	WISCONSIN	1/82	3	A

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
5. PLANNED - REQUESTING/EVALUATING BIDS
6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. BOILER CONSTRUCTED SUBJECT TO FEDERAL NSPS
B. BOILER SUBJECT TO STATE STANDARD THAT IS MORE STRINGENT THAN THE FEDERAL NSPS
C. BOILER SUBJECT TO STATE STANDARD THAT IS EQUAL TO OR LESS STRINGENT THAN NSPS
D. OTHER
E. REGULATORY CLASS UNKNOWN

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ALABAMA ELECTRIC COOP TOMBIGBEE 2 NEW 255.0 MW (GROSS) 179.0 MW (ESC) COAL 1.15 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/78	TOMBIGBEE 2 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.2% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO2 EMMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE MATTER CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED FOR EACH TOWER AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID-BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND SPENT ABSORBENT IS DISPOSED OF IN AN ON-SITE LINED POND.
ALABAMA ELECTRIC COOP TOMBIGBEE 3 NEW 255.0 MW (GROSS) 179.0 MW (ESC) COAL 1.15 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 6/79	TOMBIGBEE 3 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.2% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO2 EMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED IN EACH TOWER, AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND SPENT ABSORBENT IS DISPOSED IN AN ON-SITE LINED POND.
ALLEGHENY POWER SYSTEM MITCHELL 33 RETROFIT 300.0 MW (GROSS) 300.0 MW (ESC) COAL 2.80 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 8/82	UNIT 33 AT ALLEGHENY POWER SYSTEM'S MITCHELL POWER STATION IN COURTNEY, PENNSYLVANIA IS A 2.8% SULFUR COAL FIRED BOILER. A CONTRACT WAS AWARDED TO CHEMICO FOR A LIME SCRUBBING PROCESS. SO2 REMOVAL EFFICIENCY WILL BE 95%. START UP IS PLANNED FOR AUGUST OF 1982.
ALLEGHENY POWER SYSTEM PLEASANTS 1 NEW 625.0 MW (GROSS) 519.0 MW (ESC) COAL 3.70 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 3/79	ALLEGHENY POWER SYSTEM'S PLEASANTS 1 IS A BITUMINOUS COAL (3.70% S, 12,150 BTU/LB) FIRED BOILER IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX SUPPLIED A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE FLUE GAS SO2 FROM THIS UNIT. THE EMISSION CONTROL SYSTEM INCLUDES AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM PROVIDES REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. THE FGD SYSTEM ON THIS UNIT HAS BEEN OPERATIONAL SINCE MARCH OF 1979.
ALLEGHENY POWER SYSTEM PLEASANTS 2 NEW 625.0 MW (GROSS) 519.0 MW (ESC) COAL 4.50 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 9/80	ALLEGHENY POWER SYSTEM'S PLEASANTS 2 IS A BITUMINOUS COAL (3.7% S, 12,150 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX IS SUPPLYING A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE BOILER FLUE GAS SO2. THE EMISSION CONTROL SYSTEM ON THIS UNIT WILL INCLUDE AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM WILL PROVIDE REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP. FGD SYSTEM START UP IS EXPECTED IN SEPTEMBER, 1980.
ARIZONA ELECTRIC POWER COOP APACHE 2 NEW 195.0 MW (GROSS) 195.0 MW (ESC) COAL .55 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 8/78	APACHE 2 OF ARIZONA ELECTRIC POWER COOP IS LOCATED IN COCHISE, ARIZONA AND IS A DRY BOTTOM PULVERIZED COAL FIRED UNIT WITH A FLUE GAS FLOW OF 735,000 ACFM. BITUMINOUS COAL WITH A HEATING VALUE OF 10,000 BTU/LB, A SULFUR CONTENT OF 0.7% AND AN ASH CONTENT OF 15% IS THE FUEL USED FOR THIS UNIT. PARTICULATE CONTROL IS EFFECTED BY A HOT SIDE ESP. THE UNIT IS CURRENTLY IN OPERATION WITH STARTUP IN AUGUST 1978. TWO PACKED TOWERS EMPLOYING LIMESTONE ABSORBENT AND HAVING A DESIGN SO2 REMOVAL OF 85% WERE SUPPLIED BY RESEARCH COTTRELL. MIST ELIMINATION IS PROVIDED BY CHEVRON TYPE ELIMINATORS. NO REHEAT IS EMPLOYED. A 400 FT COLE BRAND CXL2000 LINED STACK IS IN USE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND WASTE MATERIAL IS DISPOSED OF IN OFF-SITE SLUDGE PONDS.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA ELECTRIC POWER COOP APACHE 3 NEW 195.0 MW (GROSS) 195.0 MW (ESC) COAL .55 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 6/79	APACHE 3 OF ARIZONA ELECTRIC POWER COOP IS A DRY BOTTOM, PULVERIZED COAL FIRED UNIT IN COCHISE, ARIZONA. LOW (0.7%) SULFUR BITUMINOUS COAL WITH AN AVERAGE HEATING VALUE OF 10,000 BTU/LB PRODUCES A MAXIMUM FLUE GAS FLOW OF 735,000 ACFM. THE FLUE GAS PASSES THROUGH A HOT SIDE ESP TO TWO RESEARCH COTTRELL PACKED TOWERS, WHERE LIMESTONE IS USED TO REMOVE 85% (DESIGN) OF THE SO2. THE GAS EXITS A HORIZONTAL CHEVRON MIST ELIMINATOR INTO ITS OWN CEILCOTE LINED FLUE IN THE 400 FOOT STACK IT SHARES WITH UNIT 2. THE FGD, WHICH HAS BEEN OPERATIONAL SINCE JUNE OF 1979, USES NO REHEAT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP AND SLUDGE IS DISPOSED OF IN TWO OFF SITE LINED PONDS WITH 20 YEARS' EXPECTED LIFESPAN. TWO ADDITIONAL PONDS ARE PLANNED, WHICH WOULD ADD ANOTHER 20 YEARS' CAPACITY.
ARIZONA PUBLIC SERVICE CHOLLA 1 RETROFIT 119.0 MW (GROSS) 119.0 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 10/73	ARIZONA PUBLIC SERVICE'S CHOLLA 1 IS LOCATED IN JOSEPH CITY, ARIZONA AND IS A TANGENTIALLY FIRED, WET BOTTOM PULVERIZED COAL UNIT. IT IS FUELED BY BITUMINOUS COAL THAT HAS A SULFUR CONTENT OF 0.5% AND A HEATING VALUE OF 10,150 BTU/LB. PARTICULATE MATTER IS CONTROLLED BY TWO FLOODED DISC SCRUBBERS. THE FGD SYSTEM BEGAN IN OCTOBER, 1973 AND IS NOW OPERATIONAL. SO2 IS CONTROLLED BY ONE TOWER WITH MUNTERS PACKING EMPLOYING A LIMESTONE ABSORBENT. THE UNIT WAS SUPPLIED BY RESEARCH COTTRELL AND HAS A DESIGN REMOVAL OF 92%. CHEVRON MIST ELIMINATORS ARE LOCATED PRIOR TO AN IN-LINE STEAM REHEAT SYSTEM. THE TREATED FLUE GAS IS VENTED TO A 256 FT ACID BRICK LINED STACK. THE FGD SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND THE UNTREATED WASTE IS DISPOSED OF IN AN ON-SITE UNLINED POND.
ARIZONA PUBLIC SERVICE CHOLLA 2 NEW 350.0 MW (GROSS) 350.0 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/78	CHOLLA 2 OF ARIZONA PUBLIC SERVICE IS LOCATED IN JOSEPH CITY, ARIZONA. THE BOILER BURNS PULVERIZED BITUMINOUS COAL (0.5% S, 10,150 BTU/LB). MECHANICAL COLLECTORS PROVIDE PRIMARY PARTICULATE CONTROL. FOUR PARALLEL FLOODED DISC AND PACKED TOWER SO2 ABSORBER TRAINS (THREE ARE REQUIRED FOR FULL LOAD) REMOVE THE FLUE GAS SO2. THE DESIGN SO2 REMOVAL FOR THE SYSTEM, WHICH BEGAN OPERATIONS IN APRIL, 1978, IS 75%. THE CLEANED GAS PASSES THROUGH AN IN-LINE STEAM REHEATER INTO AN ACID BRICK LINED STACK. THE OPEN WATER LOOP SYSTEM DEPOSITS ITS SLUDGE INTO A FLY ASH POND.
ARIZONA PUBLIC SERVICE CHOLLA 4 NEW 350.0 MW (GROSS) 126.0 MW (ESC) COAL .50 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	CHOLLA 4 OF ARIZONA PUBLIC SERVICE IS PRESENTLY UNDER CONSTRUCTION IN JOSEPH CITY, ARIZONA. START UP IS SCHEDULED FOR JUNE, 1980. THE PULVERIZED COAL (0.5% S, 10,150 BTU/LB) FIRED BOILER WILL EXHAUST FLUE GAS THROUGH AN ESP TO A PACKED TOWER WHICH WILL TREAT 36% OF THE GAS WITH LIMESTONE.
ARIZONA PUBLIC SERVICE FOUR CORNERS 1 RETROFIT 175.0 MW (GROSS) 175.0 MW (ESC) COAL .75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/79	ARIZONA PUBLIC SERVICE IS UPGRADING THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1, 2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. CURRENTLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY AFTER THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. START UP IS EXPECTED SOMETIME IN 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 2 RETROFIT 175.0 MW (GROSS) 175.0 MW (ESC) COAL .75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/79	ARIZONA PUBLIC SERVICE IS UPGRADING THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. CURRENTLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY AFTER THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. START UP IS EXPECTED SOMETIME IN 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA PUBLIC SERVICE FOUR CORNERS 3 RETROFIT 229.0 MW (GROSS) 229.0 MW (ESC) COAL .75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/79	ARIZONA PUBLIC SERVICE IS UPGRADING THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. CURRENTLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8650 BTU/LB) UNIT 3 SUPPLIES 1,030,000 ACFM INTO 2 CHEMICO VENTURI SCRUBBERS FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY AFTER THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. STARTUP IS EXPECTED SOMETIME IN 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 4 RETROFIT 755.0 MW (GROSS) 755.0 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982.
ARIZONA PUBLIC SERVICE FOUR CORNERS 5 RETROFIT 755.0 MW (GROSS) 755.0 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982.
ASSOCIATED ELECTRIC COOP THOMAS HILL 3 NEW 730.0 MW (GROSS) 670.0 MW (ESC) COAL 4.80 %S LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/82	THOMAS HILL 3 OF ASSOCIATED ELECTRIC COOP IS A PULVERIZED COAL (4.8% S, 9,700 BTU/LB) FIRED UNIT LOCATED IN MOBERLY, MISSOURI. TWO COLD SIDE ESP'S WILL PRECEDE THE FOUR 91.5% EFFICIENT PULLMAN KELLOGG HORIZONTAL WEIR FGD MODULES USING MAGNESIUM-PROMOTED LIMESTONE AS THE ABSORBENT. THE CLEANED GAS WILL PASS THROUGH A VERTICAL CHEVRON MIST ELIMINATOR TO A 620 FOOT BRICK LINED STACK. REHEAT WILL BE ACCOMPLISHED BY BYPASS. DRY FIXATED SLUDGE WILL BE TRUCKED TO AN ACTIVE STRIP MINE. THE SYSTEM WILL USE A CLOSED WATER LOOP. THE FGD SYSTEM IS UNDER CONSTRUCTION AND START UP IS EXPECTED IN JANUARY, 1982.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 1 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .68 %S LIGNITE LIME/SPRAY DRYING JOY MFG. CO, WESTERN PRECIPITA ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 11/81	UNIT 1 OF BASIN ELECTRIC POWER COOP'S ANTELOPE VALLEY PLANT IS PRESENTLY UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT WILL BURN PULVERIZED COAL (0.68% S, 6600 BTU/LB LIGNITE) AND SUPPLY 2,055,000 ACFM TO A DRY LIME FGD SYSTEM SUPPLIED BY WESTERN PRECIPITATION. THE 62% EFFICIENT SYSTEM WILL CONSIST OF 5 NIRO ATOMIZER SPRAY DRYERS AND TWO BAGHOUSES. THE CLEANED GAS, ALONG WITH A 4% BYPASS REHEAT, WILL EXIT A 600 FOOT PVC LINED STACK. THE SYSTEM WILL USE A CLOSED WATER LOOP AND THE DRY POWDER WILL BE USED FOR LANDFILL IN A COAL MINE. START UP IS EXPECTED IN NOVEMBER, 1981.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 2 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .68 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 11/83	ANTELOPE VALLEY 2 OF BASIN ELECTRIC POWER COOP WILL BE LOCATED IN BEULAH, NORTH DAKOTA. THE UTILITY IS PRESENTLY CONSIDERING VARIOUS FGD PROCESSES FOR THIS LIGNITE (0.68% S, 6600 BTU/LB) FIRED UNIT. THE UNIT WILL BE REQUIRED TO COMPLY WITH STATE EMISSIONS STANDARDS VIA BEST AVAILABLE CONTROL TECHNOLOGY. START UP IS SCHEDULED FOR NOVEMBER, 1983.

UNIT IDENTIFICATION	ABSTRACT
BASIN ELECTRIC POWER COOP LARAMIE RIVER 1 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL .80 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/80	BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 1 IS PRESENTLY UNDER CONSTRUCTION IN WHEATLAND, WYOMING. THE PULVERIZED COAL (0.81% S, 8139 BTU/LB) FIRED BOILER WILL FEED 2,300,000 ACFM OF FLUE GAS THROUGH A COLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL EXIT FROM A VERTICAL CHEVRON DEMISTER INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE USED. THE FLYASH FIXATED SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM WILL EMPLOY A CLOSED WATER LOOP. START UP IS SCHEDULED FOR APRIL, 1980.
BASIN ELECTRIC POWER COOP LARAMIE RIVER 2 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL .80 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 2 IS PRESENTLY UNDER CONSTRUCTION IN WHEATLAND, WYOMING. THE PULVERIZED COAL (0.81% S, 8139 BTU/LB) FIRED BOILER WILL FEED 2,300,000 ACFM OF FLUE GAS THROUGH A OLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL EXIT FROM A VERTICAL CHEVRON DEMISTER INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE USED. THE FLYASH FIXATED SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM WILL EMPLOY A CLOSED WATER LOOP. START UP IS SCHEDULED FOR OCTOBER, 1980.
BASIN ELECTRIC POWER COOP LARAMIE RIVER 3 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL .54 %S LIME/SPRAY DRYING BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 7/81	LARAMIE RIVER 3 OF BASIN ELECTRIC POWER COOP IS TO BE CONSTRUCTED IN WHEATLAND, WYOMING, AND WILL UTILIZE FOUR DRY LIME INJECTION MODULES, EACH FOLLOWED BY AN ESP. THE BOILER WILL FIRE PULVERIZED COAL (0.54% S, 8100 BTU/LB) AND WILL SUPPLY 2,800,000 ACFM OF FLUE GAS TO THE FGD SYSTEM, WHICH WILL REMOVE 85% OF THE SO2 BEFORE THE GAS EXITS THROUGH A 600 FOOT ACID BRICK LINED STACK. A 3% BYPASS WILL BE USED FOR REHEAT. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND WILL LANDFILL THE DRY POWDER WASTE. CONSTRUCTION IS SLATED TO BEGIN IN JANUARY, 1980, AND START UP IS SCHEDULED FOR JULY, 1981.
BIG RIVERS ELECTRIC GREEN 1 NEW 242.0 MW (GROSS) 242.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/79	UNIT 1 OF BIG RIVERS ELECTRIC'S GREEN STATION IS BEING CONSTRUCTED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER WILL SUPPLY 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR AND WILL EXIT A SAVERISEM 72 LINED STACK AFTER IT IS HEATED BY STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED. START UP IS SCHEDULED FOR OCTOBER, 1979.
BIG RIVERS ELECTRIC GREEN 2 NEW 242.0 MW (GROSS) 242.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	UNIT 2 OF BIG RIVERS ELECTRIC'S GREEN STATION IS BEING CONSTRUCTED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER WILL SUPPLY 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR AND WILL EXIT A SAVERISEM 72 LINED STACK AFTER IT IS HEATED BY STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED. START UP IS SCHEDULED FOR JUNE, 1980.
CENTRAL ILLINOIS LIGHT DUCK CREEK 1 NEW 416.0 MW (GROSS) 378.0 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 2.9% STATUS 1 STARTUP 9/76	DUCK CREEK 1 OF CENTRAL ILLINOIS LIGHT IS LOCATED IN CANTON, ILLINOIS. THE BALANCED DRAFT, FRONT FIRED, DRY BOTTOM UNIT BURNS PULVERIZED BITUMINOUS COAL (3.3% S, 10,500 BTU/LB) AND SUPPLIES 2,415,000 ACFM OF FLUE GAS TO TWO COLD SIDE ESP'S FOLLOWED BY FOUR RILEY STOKER/ENVIRONEERING ROD DECK SPRAY TOWER MODULES. THE FGD SYSTEM HAS BEEN OPERATIONAL (ONE MODULE) SINCE JULY, 1976, AND IS DESIGNED TO REMOVE 85% OF THE SO2. HORIZONTAL CHEVRON MIST ELIMINATORS FOLLOW THE ABSORBERS, AND THE CLEANED GAS EXITS TO A 500 FOOT CEILCOTE LINED STACK WITHOUT REHEAT. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SLUDGE IS DISPOSED OF IN AN ON SITE CLAY LINED POND.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
CENTRAL ILLINOIS LIGHT DUCK CREEK 2 NEW 416.0 MW (GROSS) 416.0 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.9% STATUS 5 STARTUP 1/84	CENTRAL ILLINOIS LIGHT IS CURRENTLY EVALUATING BIDS ON A LIMESTONE OR DUAL ALKALI FGD SYSTEM FOR UNIT 2 OF ITS DUCK CREEK STATION. THE BITUMINOUS COAL FIRED BOILER WILL FEED ITS FLUE GAS THROUGH A COLD SIDE ESP. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP AND IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1984.
CENTRAL ILLINOIS PUBLIC SERV NEWTON 1 NEW 617.0 MW (GROSS) 617.0 MW (ESC) COAL 4.00 %S BITUMINOUS DUAL ALKALI BUELL/ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 9/79	NEWTON 1 OF CENTRAL ILLINOIS PUBLIC SERVICE IS A TANGENTIALLY FIRED, DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4% S, 10,900 BTU/LB) FIRED UNIT LOCATED IN NEWTON, ILLINOIS. A COLD SIDE ESP RECIEVES 2,163,480 ACFM OF FLUE GAS AND FEEDS IT TO FOUR BUELL ENVIROTECH POLYSPHERE PACKED TRAY TOWERS FOLLOWED BY TWO VERTICAL MIST ELIMINATORS PER MODULE. THE CLEANED GAS IS BOOSTED 25 DEG F BY A COMBINATION OF TWO DIFFERENT TYPES OF IN-LINE REHEATERS PLUS BYPASS REHEAT, AND THEN EXITS A 530 FOOT PRECRETE LINED STACK. THE WATER LOOP IS CLOSED, AND THE SLUDGE IS POZ-O-TEC TREATED.
CENTRAL MAINE POWER SEARS ISLAND 1 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL ***** %S LIME/LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 11/87	SEARS ISLAND 1 IS A PLANNED UNIT TO BE BUILT ON PENOBSCOT BAY BY CENTRAL MAINE POWER. BECAUSE OF THE DISCOVERY OF A GEOLOGICAL FAULT ON SEARS ISLAND, PLANS FOR A 1150 MW NUCLEAR POWER PLANT HAVE BEEN REPLACED WITH PLANS FOR A 600 MW COAL FIRED PLANT. LIME AND LIMESTONE SCRUBBING ARE THE PRIMARY METHODS BEING CONSIDERED FOR COMPLIANCE WITH THE NSPS. IT WILL BE TWO YEARS BEFORE ALL PERMITS REQUIRED HAVE BEEN RECIEVED. START UP IS SCHEDULED FOR NOVEMBER, 1987.
CINCINNATI GAS & ELECTRIC EAST BEND 2 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 5.00 %S LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.9% STATUS 2 STARTUP 10/81	EAST BEND 2 OF CINCINNATI GAS AND ELECTRIC IS A PULVERIZED COAL (5% S) FIRED BOILER UNDER CONSTRUCTION IN RABBITHASH, KENTUCKY. THE EMISSION CONTROL SYSTEM CONSISTS OF A HOT SIDE ESP FOLLOWED BY THREE BABCOCK AND WILCOX LIME FGD MODULES. THE 87% CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR BEFORE BEING WARMED BY AN INDIRECT HOT AIR REHEATER AND EXITING THROUGH A BRICK LINED 650 FOOT STACK. THE SLUDGE FROM THIS CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED BEFORE DISPOSAL IN AN ON SITE LANDFILL. START UP IS EXPECTED IN OCTOBER, 1981.
COLORADO UTE ELECTRIC ASSN. CRAIG 1 NEW 447.0 MW (GROSS) 447.0 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 5.4% STATUS 2 STARTUP 1/80	THE COLORADO UTE ELECTRIC ASSN IS PRESENTLY CONSTRUCTING TWO IDENTICAL UNITS IN CRAIG, COLORADO, CRAIG 1 AND 2. BOTH UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). EACH UNIT'S HOT SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS WILL REMOVE 85% OF THE SO2. THE SCRUBBER EXHAUST WILL BE WARMED BY AN IN-LINE STEAM COIL REHEATER AND WILL PASS THROUGH A 600 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE STABILIZED SLUDGE WILL BE DISPOSED OF IN AN OFF SITE MINEFILL. UNIT 1 START UP IS EXPECTED IN AUGUST, 1979.
COLORADO UTE ELECTRIC ASSN. CRAIG 2 NEW 447.0 MW (GROSS) 447.0 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 5.4% STATUS 2 STARTUP 8/79	THE COLORADO UTE ELECTRIC ASSN IS PRESENTLY CONSTRUCTING TWO IDENTICAL UNITS IN CRAIG, COLORADO, CRAIG 1 AND 2. BOTH UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). EACH UNIT'S HOT SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS WILL REMOVE 85% OF THE SO2. THE SCRUBBER EXHAUST WILL BE WARMED BY AN IN-LINE STEAM COIL REHEATER AND WILL PASS THROUGH A 600 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE STABILIZED SLUDGE WILL BE DISPOSED OF IN AN OFF SITE MINEFILL. START UP OF UNIT 2 IS EXPECTED IN OCTOBER, 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 5 NEW 411.0 MW (GROSS) 411.0 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 1/77	CONESVILLE 5 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECIEVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO2 REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JANUARY, 1977, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP.
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 6 NEW 411.0 MW (GROSS) 411.0 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 6/78	CONESVILLE 6 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECIEVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO2 REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JUNE, 1978, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP.
COLUMBUS & SOUTHERN OHIO ELEC. POSTON 5 NEW 375.0 MW (GROSS) 375.0 MW (ESC) COAL 2.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/83	COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 5 IS EXPECTED IN 1983.
COLUMBUS & SOUTHERN OHIO ELEC. POSTON 6 NEW 375.0 MW (GROSS) 375.0 MW (ESC) COAL 2.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/89	COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 6 IS EXPECTED IN 1989.
COMMONWEALTH EDISON POWERTON 51 RETROFIT 450.0 MW (GROSS) 450.0 MW (ESC) COAL 3.60 %S LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 5.6% STATUS 2 STARTUP 11/79	COMMONWEALTH EDISON IS PRESENTLY RETROFITTING BOILER NUMBER 51 AT ITS POWERTON STATION WITH A UOP LIMESTONE FGD SYSTEM. UNIT 51 IS ONE OF TWO IDENTICAL BOILERS SUPPLYING STEAM TO AN 850 MW TURBINE. THE PULVERIZED COAL (3.6% S, 10,500 BTU/LB) FIRED BOILER FEEDS FLUE GAS THROUGH AN ESP TO 3 TCA MODULES WHICH ARE DESIGNED TO REMOVE 74% OF THE SO2. A STEAM INDIRECT HOT AIR REHEATER WILL BOOST THE TEMPERATURE BEFORE THE GAS EXITS AN ACID BRICK LINED STACK. THE SYSTEM WILL UTILIZE A CLOSED WATER LOOP, AND THE SLUDGE WILL BE POZ-O-TEC STABILIZED AND DISPOSED OF IN A LANDFILL. THE FGD SYSTEM IS UNDER CONSTRUCTION, AND THE START UP IS EXPECTED IN NOVEMBER, 1979.
COOPERATIVE POWER ASSOCIATION COAL CREEK 1 NEW 545.0 MW (GROSS) 327.0 MW (ESC) COAL .63 %S LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 8/79	COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT WILL BE PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE WILL BE DISPOSED IN A CLAY LINED POND. UNIT 1 OPERATIONS BEGAN IN AUGUST 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
COOPERATIVE POWER ASSOCIATION COAL CREEK 2 NEW 545.0 MW (GROSS) 327.0 MW (ESC) COAL .63 %S LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT WILL BE PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE WILL BE DISPOSED OF IN A CLAY LINED POND. UNIT 2 IS PRESENTLY UNDER CONSTRUCTION AND SHOULD INITIALLY START OPERATIONS IN OCTOBER, 1980.
DELMARVA POWER & LIGHT DELAWARE CITY 1-3 RETROFIT 180.0 MW (GROSS) 180.0 MW (ESC) COKE 7.50 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/80	DELMARVA POWER & LIGHT'S DELAWARE CITY PLANT HAS FOUR BOILERS, THREE OF WHICH HAVE STEAM CAPACITIES OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. LOW SULFUR CRUDE OIL WILL BE REPLACED WITH COKE (7-8% S) IN THE BOILER WHEN THE FGD SYSTEM IS COMPLETE, IN APRIL, 1980. A VENTURI PARTICULATE SCRUBBER AND A WELLMAN-LORD FGD SYSTEM (90% DESIGN EFFICIENCY) SUPPLIED BY DAVY POWERGAS ARE PRESENTLY UNDER CONSTRUCTION. AN INDIRECT GAS REHEATER WILL BE USED. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP.
DUQUESNE LIGHT ELRAMA 1-4 RETROFIT 510.0 MW (GROSS) 510.0 MW (ESC) COAL 2.20 %S LIME CHEMICO ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 10/75	ELRAMA 1-4 OF DUQUESNE LIGHT CONSISTS OF FOUR PULVERIZED COAL (2.2% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN ELRAMA, PENNSYLVANIA. THE EMISSION CONTROL SYSTEM ON THIS SITE CONSISTS OF AN ESP FOLLOWED BY A MECHANICAL COLLECTOR AND FIVE VARIABLE THROAT VENTURI LIME ABSORBER MODULES SUPPLIED BY CHEMICO, WHICH ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. THE CLEANED GAS PASSES THROUGH A DIRECT OIL FIRED REHEATER BEFORE EXITING A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS HAULED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE OCTOBER, 1975.
DUQUESNE LIGHT PHILLIPS 1-6 RETROFIT 408.0 MW (GROSS) 410.0 MW (ESC) COAL 1.92 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 7/73	THE PHILLIPS POWER STATION OF DUQUESNE LIGHT CONSISTS OF SIX DRY BOTTOM PULVERIZED COAL (2.2% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN SOUTH HEIGHT, PENNSYLVANIA. PARTICULATE CONTROL IS ACCOMPLISHED BY SIX ESP/MECHANICAL COLLECTOR COMBINATIONS (ONE/BOILER). ONE TWO STAGE AND THREE SINGLE STAGE VARIABLE THROAT VENTURI LIME FGD MODULES SUPPLIED BY CHEMICO ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT OIL FIRED REHEATER WHICH RAISES THE GAS TEMPERATURE BY 20 DEG F BEFORE IT LEAVES VIA A 340 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM ORERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS TRUCKED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JULY, 1973.
EAST KENTUCKY POWER COOP SPURLOCK 2 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL 3.50 %S LIME ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	SPURLOCK 2 OF EAST KENTUCKY POWER COOPERATIVE IS A BALANCED DRAFT PULVERIZED COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN MAYSVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP FOLLOWED BY AN ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME FGD SYSTEM (90% DESIGN SO2 REMOVAL EFFICIENCY). FLUE GAS FROM UNIT ONE WILL BE USED TO REHEAT THE CLEANED GAS. THE SYSTEM, SLATED FOR START UP IN OCTOBER, 1980, WILL EMPLOY A CLOSED WATER LOOP AND POZ-O-TEC SLUDGE STABILIZATION.
GENERAL PUBLIC UTILITIES COHO 1 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL 3.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 12/88	COHO 1 IS A 3.5% S COAL FIRED UNIT PLANNED BY GENERAL PUBLIC UTILITIES TO BE LOCATED IN ERIE, PENNSYLVANIA. PRIMARY CONSIDERATION IS BEING GIVEN TO LIME AND LIMESTONE NON-SLURRY TYPE FGD SYSTEMS. THE UNIT AND FGD SYSTEM ARE SCHEDULED TO START UP IN DECEMBER, 1988.

UNIT IDENTIFICATION	ABSTRACT
GENERAL PUBLIC UTILITIES SEWARD 7 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 12/87	GENERAL PUBLIC UTILITIES IS PLANNING A NEW UNIT, SEWARD 7, TO BE BUILT IN SEWARD, PENNSYLVANIA. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY, WITH NON-SLURRY TYPE LIME AND LIMESTONE SYSTEMS LOOKING THE MOST PROMISING. START UP IS EXPECTED IN DECEMBER, 1987.
HOOSIER ENERGY MEROM 1 NEW 490.0 MW (GROSS) 441.0 MW (ESC) COAL 3.50 %S LIMESTONE MITSUBISHI INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 4/81	MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WITH PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 1 IS SCHEDULED FOR APRIL, 1981.
HOOSIER ENERGY MEROM 2 NEW 490.0 MW (GROSS) 441.0 MW (ESC) COAL 3.50 %S LIMESTONE MITSUBISHI INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/82	MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WITH PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 2 IS SCHEDULED FOR JANUARY, 1982.
HOUSTON LIGHTING & POWER CO. W.A. PARISH 8 NEW 550.0 MW (GROSS) 512.0 MW (ESC) COAL .60 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 11/82	W.A. PARISH 8 IS A PULVERIZED COAL (0.6% S, 8700 BTU/LB) FIRED UNIT PLANNED BY HOUSTON LIGHTING AND POWER CO TO BE LOCATED IN THOMPSONS, TEXAS. THE UTILITY HAS AWARDED A CONTRACT TO CHEMICO FOR A LIMESTONE FGD SYSTEM WHICH WILL REMOVE 85% OF THE FLUE GAS SO2. REHEAT WILL BE PROVIDED BY BYPASSING 7% OF THE PARTICULATE CLEANED FLUE GAS. SLUDGE WILL BE DEWATERED, BLENDED WITH FLYASH, AND DISPOSED IN AN ON SITE LANDFILL. START UP IS EXPECTED IN NOVEMBER, 1982.
INDIANAPOLIS POWER & LIGHT PETERSBURG 3 NEW 532.0 MW (GROSS) 532.0 MW (ESC) COAL 3.25 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 12/77	PETERSBURG 3 OF INDIANAPOLIS POWER AND LIGHT IS LOCATED IN PETERSBURG, INDIANA, AND BURNS 4.5% S BITUMINOUS COAL (11,000 BTU/LB). TWO COLD SIDE ESP'S ARE LOCATED UPSTREAM OF 4 85% EFFICIENT UOP LIMESTONE TCA MODULES. A HORIZONTAL MIST ELIMINATOR PRECEDES AN INDIRECT HOT AIR REHEATER THAT BOOSTS THE GAS TEMPERATURE BY 30 DEG F BEFORE IT EXITS THE 616 FOOT RIGIFLAKE 4850 LINED STACK. STABILIZED SLUDGE IS DISPOSED IN AN ON SITE POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. THIS UNIT HAS BEEN OPERATIONAL SINCE DECEMBER, 1977.
INDIANAPOLIS POWER & LIGHT PETERSBURG 4 NEW 530.0 MW (GROSS) 530.0 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/83	PETERSBURG 4 OF INDIANAPOLIS POWER AND LIGHT IS A BITUMINOUS COAL (3.50% S 11,000 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN PETERSBURG, INDIANA. THE LIMESTONE FGD SYSTEM FOR THIS UNIT WILL BE SUPPLIED BY RESEARCH COTTRELL. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND SLUDGE WILL BE POZ-O-TEC STABILIZED BEFORE PONDING. START UP IS SLATED FOR OCTOBER OF 1983.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
KANSAS CITY POWER & LIGHT HAWTHORN 3 RETROFIT 90.0 MW (GROSS) 90.0 MW (ESC) COAL .60 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 11/72	HAWTHORN 3 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6% S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY, 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.
KANSAS CITY POWER & LIGHT HAWTHORN 4 RETROFIT 90.0 MW (GROSS) 90.0 MW (ESC) COAL .60 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 8/72	HAWTHORN 4 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6% S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY, 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.
KANSAS CITY POWER & LIGHT LA CYGNE 1 NEW 874.0 MW (GROSS) 874.0 MW (ESC) COAL 5.39 %S SUBBITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 2/73	LA CYGNE 1 IS A WET BOTTOM, CYCLONE FIRED PULVERIZED SUBBITUMINOUS COAL (5.39% S, 9421 BTU/LB) FIRED UNIT OF KANSAS CITY POWER AND LIGHT, LOCATED IN LA CYGNE, KANSAS. THE EMISSION CONTROL SYSTEM CONSISTS OF EIGHT VARIABLE THROAT VENTURI/LIMESTONE SIEVE TRAY TOWER TRAINS SUPPLIED BY BABCOCK AND WILCOX. EACH 80% (SO2 REMOVAL, DESIGN) EFFICIENT TRAIN IS FOLLOWED BY A COMBINATION SIEVE TRAY AND CHEVRON MIST ELIMINATOR, FOLLOWED BY AN INDIRECT REHEATER. THE CLEANED GAS EXITS THROUGH A 700 FOOT STEEL LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SCRUBBER SLUDGE IS DISPOSED IN AN UNLINED POND. INITIAL OPERATIONS OF THE FGD SYSTEM BEGAN IN FEBRUARY, 1973.
KANSAS POWER & LIGHT JEFFREY 1 NEW 720.0 MW (GROSS) 540.0 MW (ESC) COAL .32 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 8/78	KANSAS CITY POWER AND LIGHT'S JEFFREY 1 IS A TANGENTIAL FIRED PULVERIZED COAL (0.32% S, 8125 BTU/LB) UNIT IN WAMEGO, KANSAS. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY SIX (ONE SPARE) LIMESTONE SPRAY TOWER MODULES SUPPLIED BY COMBUSTION ENGINEERING. THE DESIGN SO2 REMOVAL EFFICIENCY IS 50% (INCLUDING A 30% BYPASS REHEAT). HAS BEEN OPERATIONAL SINCE AUGUST, 1978.
KANSAS POWER & LIGHT JEFFREY 2 NEW 700.0 MW (GROSS) 490.0 MW (ESC) COAL .30 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	UNIT 2, PRESENTLY UNDER CONSTRUCTION AT KANSAS POWER AND LIGHT'S JEFFREY ENERGY CENTER IN JEFFREY, KANSAS, WILL BURN 0.3% S PULVERIZED COAL (8100 BTU/LB). THIS UNIT'S EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP AND COMBUSTION ENGINEERING LIMESTONE SPRAY TOWERS. A 30% FLUE GAS BYPASS WILL PROVIDE REHEAT OF THE CLEANED GAS BEFORE IT EXITS THROUGH A 600 FOOT STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE, AND THE SLUDGE WILL BE STABILIZED WITH BOTTOM ASH AND PIPED TO AN ON-SITE CLAY LINED POND. SCHEDULED START UP OF THE SYSTEM IS JUNE 1980.
KANSAS POWER & LIGHT LAWRENCE 4 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .55 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 1/76	LAWRENCE 4 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN JANUARY, 1977. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO2 REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
KANSAS POWER & LIGHT LAWRENCE 5 RETROFIT 420.0 MW (GROSS) 420.0 MW (ESC) COAL .55 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/71	LAWRENCE 5 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN APRIL, 1978. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO2 REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.
KENTUCKY UTILITIES GREEN RIVER 1-3 RETROFIT 64.0 MW (GROSS) 64.0 MW (ESC) COAL 4.00 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/75	GREEN RIVER 1-3 OF KENTUCKY UTILITIES ARE THREE DRY BOTTOM PULVERIZED BITUMINOUS COAL (4% S, 11,000 BTU/LB) FIRED UNITS LOCATED IN CENTRAL CITY, KENTUCKY. EACH BOILER SUPPLIES 360,000 ACFM OF FLUE GAS TO A VARIABLE THROAT VENTURI FOLLOWED BY AN AMERICAN AIR FILTER LIME MOBILE BED CONTACTOR (80% DESIGN SO2 REMOVAL EFFICIENCY). A RADIAL VANE MIST ELIMINATOR IS FOLLOWED BY A STEAM TUBE REHEATER AND A 165 FOOT STACK. SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP. THE SYSTEM HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1975.
LAKELAND UTILITIES MCINTOSH 3 NEW 364.0 MW (GROSS) 364.0 MW (ESC) COAL 2.56 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 10/81	MCINTOSH 3 OF LAKELAND UTILITIES IS A PLANNED UNIT TO BE LOCATED IN LAKELAND, FLORIDA. BABCOCK AND WILCOX HAS BEEN AWARDED A CONTRACT TO SUPPLY AN 85% EFFICIENT (SO2) LIMESTONE FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY TWO PARALLEL FGD MODULES AND A 250 FOOT ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS A CONSTRUCTION BASE. CONSTRUCTION IS SET TO BEGIN IN EARLY 1980 AND START UP IS SCHEDULED TO BE IN OCTOBER, 1981.
LOUISVILLE GAS & ELECTRIC CANE RUN 4 RETROFIT 188.0 MW (GROSS) 188.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 8/76	UNIT 4 AT LOUISVILLE GAS AND ELECTRIC'S CANE RUN STATION IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. AN ESP AND TWO AMERICAN AIR FILTER CARBIDE LIME MOBILE BED ABSORBER MODULES (85% DESIGN SO2 REMOVAL) TREAT 734,000 ACFM OF FLUE GAS FROM THE BOILER. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT COMBUSTION REHEATER AND A 250 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THIS RETROFIT SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST, 1976.
LOUISVILLE GAS & ELECTRIC CANE RUN 5 RETROFIT 190.0 MW (GROSS) 190.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 12/77	CANE RUN 5 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. THE BOILER SUPPLIES 700,000 ACFM OF FLUE GAS TO AN EMISSION CONTROL SYSTEM CONSISTING OF AN ESP FOLLOWED AND TWO COMBUSTION ENGINEERING 85% EFFICIENT (DESIGN) CARBIDE LIME SPRAY TOWERS. A STEAM TUBE REHEATER RAISES THE GAS TEMPERATURE 40 DEG F. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND THE SLUDGE IS POZ-O-TEC STABILIZED. OPERATION OF THIS RETROFIT SYSTEM BEGAN IN DECEMBER, 1977.
LOUISVILLE GAS & ELECTRIC CANE RUN 6 RETROFIT 288.0 MW (GROSS) 288.0 MW (ESC) COAL 4.80 %S BITUMINOUS DUAL ALKALI ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 1.0% STATUS 1 STARTUP 4/79	LOUISVILLE GAS AND ELECTRIC'S CANE RUN 6 IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A RETROFIT DUAL ALKALI DEMONSTRATION FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM, DESIGNED TO REMOVE 95% OF THE FLUE GAS SO2, CONSISTS OF A COLD SIDE ESP AND TWO TRAY TOWER MODULES. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND TWO DIRECT COMBUSTION REHEATERS BEFORE EXITING A 518 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED POND. FOR A ONE YEAR PERIOD FOLLOWING THE FIRST QUARTER OF OPERATION (WHICH BEGAN IN APRIL, 1979), THE U.S.EPA WILL SUBSIDIZE A MAX OF $4.5 MM FOR OPERATION, R&D, AND REPORT WRITING (NOT APPLIED TO ANY CAPITAL EXPENDITURES).

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC MILL CREEK 1 RETROFIT 358.0 MW (GROSS) 358.0 MW (ESC) COAL 3.75 %S LIME/LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 2 STARTUP 4/81	MILL CREEK 1 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME FGD SYSTEM IS PRESENTLY UNDER CONSTRUCTION ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING IS SUPPLYING A LIME FGD SYSTEM WHICH WILL COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL OF 1981.
LOUISVILLE GAS & ELECTRIC MILL CREEK 2 RETROFIT 350.0 MW (GROSS) 350.0 MW (ESC) COAL 3.75 %S LIME/LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 2 STARTUP 4/82	MILL CREEK 2 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME FGD SYSTEM IS PRESENTLY UNDER CONSTRUCTION ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING IS SUPPLYING A LIME FGD SYSTEM WHICH WILL COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL OF 1982.
LOUISVILLE GAS & ELECTRIC MILL CREEK 3 NEW 442.0 MW (GROSS) 442.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 8/78	LOUISVILLE GAS AND ELECTRIC'S MILL CREEK 3 IS A 3.75% S COAL (11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. AMERICAN AIR FILTER SUPPLIED A CARBIDE LIME FGD SYSTEM FOR THIS UNIT WHICH WAS DESIGNED TO REMOVE 85% OF THE SO2 FROM THE FLUE GAS. AN ESP IS FOLLOWED BY FOUR MOBILE BED SPRAY TOWERS AND A STEAM TUBE REHEATER. THE WATER LOOP IS OPEN, AND THE FLYASH AND LIME STABILIZED SLUDGE IS PONDED. THIS UNIT HAS BEEN OPERATIONAL SINCE AUGUST, 1978.
LOUISVILLE GAS & ELECTRIC MILL CREEK 4 NEW 495.0 MW (GROSS) 495.0 MW (ESC) COAL 3.75 %S LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/81	MILL CREEK 4 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN LOUISVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP AND FOUR MOBILE BED SPRAY TOWERS. THE SYSTEM'S WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE STABILIZED WITH LIME AND FLYASH. STEAM TUBES WILL PROVIDE REHEAT OF THE CLEANED GASES. THE SYSTEM IS SCHEDULED TO START UP IN JULY OF 1981.
LOUISVILLE GAS & ELECTRIC PADDY'S RUN 6 RETROFIT 72.0 MW (GROSS) 72.0 MW (ESC) COAL 2.50 %S LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 4/73	UNIT 6 AT LOUISVILLE GAS AND ELECTRIC'S PADDY'S RUN STATION IS A DRY BOTTOM PULVERIZED COAL (2.5% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. A RETROFIT CARBIDE LIME FGD SYSTEM BY COMBUSTION ENGINEERING TREATS 400,000 ACFM OF FLUE GAS FROM THE BOILER. AN ESP IS FOLLOWED BY TWO MARBLE BED ABSORBERS, A DIRECT COMBUSTION REHEATER, AND A 250 FOOT STACK. MIST ELIMINATION IS PROVIDED BY ONE CHEVRON/MODULE. THE LIME FIXATED SLUDGE IS TRUCKED TO AN UNLINED POND, AND THE WATER LOOP IS CLOSED. THE FGD SYSTEM BEGAN INITIAL OPERATIONS IN APRIL, 1973.
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 1 NEW 575.0 MW (GROSS) 575.0 MW (ESC) COAL 4.00 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 7/84	LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY'S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS' FLUE GAS WILL BE CLEANED BY ESP'S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 1 IS SCHEDULED FOR START UP IN JULY OF 1984.

UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 2 NEW 575.0 MW (GROSS) 575.0 MW (ESC) COAL 4.00 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 7/86	LOUISVILLF GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY"S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS" FLUE GAS WILL BE CLEANED BY ESP"S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 2 IS SCHEDULED FOR START UP IN 1986.
MIDDLE SOUTH UTILITIES ARKANSAS COAL 5 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 1/86	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. ARKANSAS COAL 5 IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1986.
MIDDLE SOUTH UTILITIES ARKANSAS COAL 6 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 1/88	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. ARKANSAS COAL 6 IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1988.
MIDDLE SOUTH UTILITIES LOUISIANA COAL 1 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/86	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. LOUISIANA COAL 1 WILL START UP IN 1986.
MIDDLE SOUTH UTILITIES LOUISIANA COAL 2 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/88	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. LOUISIANA COAL 2 WILL START UP IN 1988.
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL 1 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/85	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. MISSISSIPPI COAL 1 WILL START UP IN 1985.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL 2 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/87	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. MISSISSIPPI COAL 2 WILL START UP IN 1987.
MINNESOTA POWER & LIGHT CLAY BOSWELL 4 NEW 500.0 MW (GROSS) 475.0 MW (ESC) COAL .54 %S SUBBITUMINOUS LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 2/80	CLAY BOSWELL 4 OF MINNESOTA POWER AND LIGHT IS A SUBBITUMINOUS COAL (0.54% S, 8896 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COHASSET, MINNESOTA. PEABODY PROCESS SYSTEMS WILL SUPPLY A LIME/ALKALINE FLYASH FGD SYSTEM DESIGNED TO REMOVE 89% OF THE SO2 IN THE FLUE GAS. TWO HOT SIDE ESP'S WILL BE FOLLOWED BY VENTURI/SPRAY TOWER TRAINS. MIST ELIMINATION WILL BE PROVIDED BY A SIEVE TRAY FOLLOWED BY A SPIN VANE CHEVRON, AND REHEAT WILL BE PROVIDED BY BYPASSING 5% OF THE FLUE GAS. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE, AND THE SLUDGE WILL BE DISPOSED IN A LINED POND. OPERATIONS ARE SCHEDULED TO COMMENCE IN FEBRUARY, 1980.
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG 2 NEW 440.0 MW (GROSS) 405.0 MW (ESC) COAL .70 %S LIGNITE LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 9/77	MINNKOTA POWER COOPERATIVE'S MILTON R. YOUNG 2 IS A CYCLONE FIRED LIGNITE (0.70%S, 6500 BTU/LB) BOILER LOCATED IN CENTER, NORTH DAKOTA. THE BOILER PRODUCES 2,021,400 ACFM OF FLUE GAS, WHICH IS CLEANED BY TWO ESP'S AND TWO ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME/ALKALINE FLYASH SPRAY TOWERS (75% DESIGN SO2 REMOVAL EFFICIENCY). THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR BEFORE IT JOINS A 15% BYPASS REHEAT AND EXITS A 550 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS TRUCKED TO AN OFF-SITE MINEFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1977.
MONTANA POWER COLSTRIP 1 NEW 360.0 MW (GROSS) 360.0 MW (ESC) COAL .77 %S SUBBITUMINOUS LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 9/75	COLSTRIP 1 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN SEPTEMBER OF 1975.
MONTANA POWER COLSTRIP 2 NEW 360.0 MW (GROSS) 360.0 MW (ESC) COAL .77 %S SUBBITUMINOUS LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 5/76	COLSTRIP 2 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN MAY OF 1976.
MONTANA POWER COLSTRIP 3 NEW 700.0 MW (GROSS) 700.0 MW (ESC) COAL .70 %S LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/84	MONTANA POWER'S COLSTRIP 3 IS A PLANNED LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT TO BE LOCATED IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR JANUARY, 1984.

UNIT IDENTIFICATION	ABSTRACT
MONTANA POWER COLSTRIP 4 NEW 700.0 MW (GROSS) 700.0 MW (ESC) COAL .70 %S LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/84	MONTANA POWER'S COLSTRIP 4 IS A PLANNED LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT TO BE LOCATED IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR 1984.
MUSCATINE POWER & WATER MUSCATINE 9 NEW 160.0 MW (GROSS) 160.0 MW (ESC) COAL .30 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 5.0% STATUS 5 STARTUP 9/82	MUSCATINE 9 IS A PULVERIZED BITUMINOUS COAL (3% S, 11,200 BTU/LB) FIRED UNIT PLANNED BY MUSCATINE POWER AND WATER TO BE LOCATED IN MUSCATINE, IOWA. THE UTILITY IS CONSIDERING LIME AND LIMESTONE SLURRY SYSTEMS FOR EMISSION CONTROL. THE FGD SYSTEM WILL FEATURE AN ESP, TWO 100% CAPACITY TOWERS, STEAM COIL REHEAT, A CLOSED WATER LOOP, AND FORCED OXIDATION OF THE SLUDGE BEFORE LANDFILL. THE DESIGN SO2 REMOVAL WILL BE 94%. START UP WILL TAKE PLACE IN 1982.
NEVADA POWER HARRY ALLEN 1 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/86	NEVADA POWER'S HARRY ALLEN 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1986.
NEVADA POWER HARRY ALLEN 2 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/87	NEVADA POWER'S HARRY ALLEN 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1987.
NEVADA POWER HARRY ALLEN 3 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/88	NEVADA POWER'S HARRY ALLEN 3 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1988.
NEVADA POWER HARRY ALLEN 4 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/89	NEVADA POWER'S HARRY ALLEN 4 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1989.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NEVADA POWER REID GARDNER 1 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 %S BITUMINOUS SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/74	REID GARDNER 1 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1974.
NEVADA POWER REID GARDNER 2 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 %S BITUMINOUS SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/74	REID GARDNER 2 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1974
NEVADA POWER REID GARDNER 3 NEW 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 %S BITUMINOUS SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 6/76	REID GARDNER 3 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE, 1976.
NEVADA POWER REID GARDNER 4 NEW 250.0 MW (GROSS) 250.0 MW (ESC) COAL .75 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/83	REID GARDNER 4 OF NEVADA POWER IS A COAL (0.75% S, 12,450 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN MOAPA, NEVADA. THE UTILITY IS PREPARING SPECIFICATIONS FOR AN FGD SYSTEM AT THIS TIME. CONSTRUCTION IS EXPECTED TO BEGIN IN 1980, AND START UP IS EXPECTED IN 1983.
NEVADA POWER WARNER VALLEY 1 NEW 250.0 MW (GROSS) 250.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/85	NEVADA POWER'S WARNER VALLEY 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS PRESENTLY PREPARING SPECIFICATIONS FOR A SCRUBBING SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE OF 1985.
NEVADA POWER WARNER VALLEY 2 NEW 250.0 MW (GROSS) 250.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/86	NEVADA POWER'S WARNER VALLEY 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS PRESENTLY PREPARING SPECIFICATIONS FOR A SCRUBBING SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE OF 1986.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NEW ENGLAND ELECTRIC SYSTEM BRAYTON POINT 3 RETROFIT 650.0 MW (GROSS) 650.0 MW (ESC) OIL 2.20 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 7 STARTUP 0/ 0	THE BRAYTON POINT 3 UNIT OF THE NEW ENGLAND ELECTRIC SYSTEM IS LOCATED IN SOMERSET, MASSACHUSETTS. THE UNIT IS CURRENTLY FIRING LOW SULFUR FUEL OIL BUT THE EPA HAS GIVEN THE UTILITY PERMISSION TO BURN 1.5% SULFUR COAL. THE UTILITY IS INVESTIGATING VARIOUS ADVANCED REGENERABLE FGD SYSTEMS WHICH OFFER A BREAKTHROUGH IN OPERATING COSTS AND PRODUCE ELEMENTAL SULFUR AS AN END PRODUCT.
NEW YORK STATE ELEC & GAS SOMERSET 1 NEW 870.0 MW (GROSS) 870.0 MW (ESC) BITUMINOUS ***** %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/84	THE SOMERSET 1 UNIT OF THE NEW YORK STATE ELECTRIC & GAS CORP. IS A PULVERIZED COAL BOILER LOCATED IN SOMERSET, NEW YORK. THE BOILER GENERATES A FLUE GAS FLOW OF 3,100,000 ACFM AND FIRES A BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 2.4% AND AN AVERAGE HEAT CONTENT OF 12,400 BTU/LB. A COLD SIDE ESP WITH A DESIGN EFFICIENCY OF 99.77% WILL PROVIDE THE PRIMARY PARTICULATE REMOVAL. A LIMESTONE ABSORBER WITH A DESIGN REMOVAL EFFICIENCY OF >90% WILL BE USED FOR SO2 REMOVAL. THE SYSTEM WILL OPERATE IN A CLOSED LOOP MODE. THE SLUDGE IS TO BE DEWATERED AND STABILIZED BEFORE BEING LANDFILLED.
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY 66 RETROFIT 100.0 MW (GROSS) 100.0 MW (ESC) COAL 1.80 %S AQUEOUS CARBONATE ROCKWELL INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/82	CHARLES R. HUNTLEY 66 OF NIAGARA POWER COOP IS A PULVERIZED COAL (1.8% S, 12,500 BTU/LB) FIRED UNIT LOCATED IN BUFFALO, NEW YORK. A CONTRACT WAS AWARDED TO ATOMICS INTERNATIONAL FOR THE DESIGN AND INSTALLATION OF A 90% EFFICIENT RETROFIT AQUEOUS CARBONATE FGD SYSTEM WHICH WILL PRODUCE ELEMENTAL SULFUR AS AN END PRODUCT. FUNDS ARE BEING PROVIDED BY THE U.S.EPA AND THE EMPIRE STATE ELECTRIC ENERGY RESEARCH CORP. A SPRAY DRYER WILL BE FOLLOWED BY TWO BANKS OF EIGHT CYCLONES AN ESP, AND A 200 FOOT STEEL LINED STACK. THE WATER LOOP WILL BE OPEN. START UP OF THE FGD SYSTEM WILL BE IN 1982.
NORTHERN INDIANA PUB SERVICE BAILLY 7 RETROFIT 190.0 MW (GROSS) 190.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/ 0	BAILLY 7 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3% SULFUR COAL FIRED UNIT IN CHESTERTON, INDIANA. THE UTILITY IS CURRENTLY CONSIDERING RETROFITTING A LIME OR LIMESTONE FGD ON THIS BOILER AND IS WAITING FOR PERFORMANCE RESULTS FROM THE WELLMAN LORD UNIT IN SERVICE ON DEAN H. MITCHELL 11. LOW SULFUR COAL MAY BE BURNED TO COMPLY WITH SO2 EMISSION REGULATIONS. APPLICABLE INDIANA SO2 REGULATIONS ARE STILL NOT FIRMLY ESTABLISHED.
NORTHERN INDIANA PUB SERVICE BAILLY 8 RETROFIT 400.0 MW (GROSS) 400.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/ 0	BAILLY 8 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3% SULFUR COAL FIRED UNIT IN CHESTERTON, INDIANA. THE UTILITY IS CURRENTLY CONSIDERING RETROFITTING A LIME OR LIMESTONE FGD ON THIS BOILER AND IS WAITING FOR PERFORMANCE RESULTS FROM THE WELLMAN LORD UNIT IN SERVICE ON DEAN H. MITCHELL 11. LOW SULFUR COAL MAY BE BURNED TO COMPLY WITH SO2 EMISSION REGULATIONS. APPLICABLE INDIANA SO2 REGULATIONS ARE STILL NOT FIRMLY ESTABLISHED.
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL 11 RETROFIT 115.0 MW (GROSS) 115.0 MW (ESC) COAL 3.50 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 7/76	NORTHERN INDIANA PUBLIC SERVICE'S DEAN H. MITCHELL 11 IS A COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT LOCATED IN GARY, INDIANA. A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS HAS BEEN OPERATING ON THIS UNIT SINCE JULY, 1976. AN ESP IS FOLLOWED BY A VARIABLE THROAT VENTURI SCRUBBER AND A TRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL EFFICIENCY). A DIRECT COMBUSTION RAISES THE CLEANED GAS TEMPERATURE 50 DEG F BEFORE THE GAS IS DISCHARGED THROUGH A 168 FOOT STAINLESS STEEL AND FRP LINED STACK. ELEMENTAL SULFUR AND SULFATE IS PRODUCED BY THE PROCESS DEVELOPED BY ALLIED CHEMICAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NORTHERN INDIANA PUB SERVICE SCHAHFER 17 NEW 421.0 MW (GROSS) 421.0 MW (ESC) COAL 3.20 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/83	SCHAHFER 17 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY IS REQUESTING/EVALUATING BIDS FOR FGD SYSTEMS FOR THIS UNIT. ALTHOUGH THE SO2 CONTROL STRATEGY HAS NOT BEEN SELECTED, THE UTILITY IS CONSIDERING A SODIUM BASED SYSTEM. PARTICULATE MATTER WILL BE CONTROLLED BY AN ESP, AND THE SYSTEM WILL INCLUDE A REHEATER. START UP IS SCHEDULED FOR JUNE OF 1983.
NORTHERN INDIANA PUB SERVICE SCHAHFER 18 NEW 421.0 MW (GROSS) 421.0 MW (ESC) COAL 3.20 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/85	SCHAHFER 18 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY IS REQUESTING/EVALUATING BIDS FOR FGD SYSTEMS FOR THIS UNIT. ALTHOUGH THE SO2 CONTROL STRATEGY HAS NOT BEEN SELECTED, THE UTILITY IS CONSIDERING A SODIUM BASED SYSTEM. PARTICULATE MATTER WILL BE CONTROLLED BY AN ESP, AND THE SYSTEM WILL INCLUDE A REHEATER. START UP IS SCHEDULED FOR JUNE OF 1985.
NORTHERN STATES POWER SHERBURNE 1 NEW 740.0 MW (GROSS) 740.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 3/76	NORTHERN STATES POWER'S SHERBURNE 1 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE MARCH OF 1976. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEM LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.
NORTHERN STATES POWER SHERBURNE 2 NEW 740.0 MW (GROSS) 740.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 4/77	NORTHERN STATES POWER'S SHERBURNE 2 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE APRIL OF 1977. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEM LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.
NORTHERN STATES POWER SHERBURNE 3 NEW 860.0 MW (GROSS) 860.0 MW (ESC) COAL .80 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 5/84	SHERBURNE 3 IS A PLANNED TANGENTIAL FIRED PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED UNIT TO BE CONSTRUCTED IN BECKER, MINNESOTA NORTHERN STATES POWER. DUE TO THE LATEST TECHNOLOGY THAT HAS BEEN DEVELOPED BIDS HAVE AGAIN BEEN OPENED. THE UTILITY IS PRESENTLY EVALUATING THREE DIFFERENT TYPES OF FGD SYSTEMS. MAY, 1984 IS EXPECTED START UP.
OTTER TAIL POWER COYOTE 1 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .87 %S LIGNITE AQUEOUS CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I. ENERGY CONSUMPTION: 1.1% STATUS 2 STARTUP 3/81	COYOTE 1 IS A CYCLONE FIRED PULVERIZED LIGNITE (0.875% S, 7050 BTU/LB) BOILER UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT IS JOINTLY OWNED BY FIVE UTILITIES, WITH OTTER TAIL POWER BEING THE MAJOR OWNER AND CONSTRUCTOR. AN AQUEOUS CARBONATE DRY FGD SYSTEM DESIGNED TO REMOVE 70% OF THE SO2 IS BEING SUPPLIED BY WHEELABRATOR-FRYE AND ATOMICS INTERNATIONAL. THE SPRAY DRYER/BAGHOUSE SYSTEM IS SCHEDULED TO START UP IN 1981.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PACIFIC GAS & ELECTRIC MONTEZUMA 1 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL .80 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/86	FOSSIL 1 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP DATE IS JUNE, 1986.
PACIFIC GAS & ELECTRIC MONTEZUMA 2 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL .80 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/87	FOSSIL 2 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP DATE IS JUNE, 1987.
PACIFIC POWER & LIGHT JIM BRIDGER 4 NEW 550.0 MW (GROSS) 550.0 MW (ESC) COAL .56 %S SUBBITUMINOUS SODIUM CARBONATE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: -.2% STATUS 2 STARTUP 9/79	PACIFIC POWER AND LIGHT'S JIM BRIDGER 4 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56% S, 9300 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN ROCK SPRINGS, WYOMING. A 91% EFFICIENT SODIUM CARBONATE FGD SYSTEM FOR THIS UNIT WILL BE SUPPLIED BY THE AIR CORRECTION DIVISION OF UOP. A COLD SIDE ESP WILL TREAT 2,720,000 ACFM OF FLUE GAS, FOLLOWED BY THREE SIEVE TRAY ABSORBERS. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. A SYSTEM CHECK OUT WAS CONDUCTED IN JULY OF 1979, AND START UP IS EXPECTED IN SEPTEMBER.
PENNSYLVANIA POWER BRUCE MANSFIELD 1 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 12/75	BRUCE MANSFIELD 1 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS, AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE DECEMBER, 1975.
PENNSYLVANIA POWER BRUCE MANSFIELD 2 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 7/77	BRUCE MANSFIELD 2 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS, AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY, 1977.
PENNSYLVANIA POWER BRUCE MANSFIELD 3 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S LIME PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/80	BRUCE MANSFIELD 3 OF PENNSYLVANIA POWER IS A SUPERCRITICAL PULVERIZED COAL (3.0% S, 11,500 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SHIPPINGPORT, PENNSYLVANIA. FOUR ESP'S WILL TREAT 3,308,000 ACFM OF FLUE GAS, FOLLOWED BY FIVE (ONE SPARE) PULLMAN KELLOGG THIOSORBIC LIME ABSORBERS WHICH WILL REMOVE 92.2% OF THE SO2. THE CLEANED GAS WILL PASS THROUGH CHEVRON MOST ELIMINATORS AND DIRECT COMBUSTION REHEATERS BEFORE DISCHARGE THROUGH A 600 FOOT INCONEL 625 LINED STACK. THE FLYASH STABILIZED SLUDGE WILL BE PIPED TO THE EXISTING OFF SITE LANDFILL PRESENTLY USED BY UNITS ONE AND TWO. START UP IS EXPECTED IN APRIL OF 1980.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PHILADELPHIA ELECTRIC CROMBY RETROFIT 150.0 MW (GROSS) 150.0 MW (ESC) COAL 3.00 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/80	PHILADELPHIA ELECTRIC HAS PLANS FOR THE RETROFIT OF AN FGD SYSTEM ON ONE OF THE TWO 3.0% SULFUR COAL FIRED BOILERS AT CROMBY STATION IN PHOENIXVILLE, PENNSYLVANIA. A CONTRACT HAS BEEN AWARDED TO UNITED ENGINEERS FOR A MAGNESIUM OXIDE SYSTEM. THE START UP DATE IS SET FOR JUNE, 1980.
PHILADELPHIA ELECTRIC EDDYSTONE 1A RETROFIT 120.0 MW (GROSS) 120.0 MW (ESC) COAL 2.60 %S BITUMINOUS MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 9/75	UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.6% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICULATE SCRUBBERS (TWO VENTRI ROD AND ONE VENTURI) PROVIDE PRIMARY PARTICULATE CONTROL. THE 1A FGD SYSTEM CONSISTS OF A MAG OX ROD DECK SPRAY TOWER FOLLOWING THE VENTURI SCRUBBER. THE 90% EFFICIENT (DESIGN) ABSORBER, A RETROFIT BY UNITED ENGINEERS, LEADS TO A LOUVER TYPE MIST ELIMINATOR, A DIRECT COMBUSTION REHEATER, AND A 249 FOOT STACK. THE SPENT SLURRY IS REGENERATED AT THE ESSEX SULFURIC ACID PLANT IN NEWARK, NEW JERSEY, AND THE MAG-OX IS RETURNED TO EDDYSTONE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1975.
PHILADELPHIA ELECTRIC EDDYSTONE 1B RETROFIT 240.0 MW (GROSS) 240.0 MW (ESC) COAL 2.60 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/80	UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.6% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICULATE SCRUBBERS (TWO ROD DECK SPRAY TOWERS AND ONE VENTURI) FOR PRIMARY PARTICULATE CONTROL. THE 1B FGD WILL FOLLOW THE TWO ROD DECK SPRAY TOWERS. A CONTRACT HAS BEEN AWARDED TO UNITED ENGINEERS FOR A MAGNESIUM OXIDE FGD SYSTEM. THE START UP DATE IS SET FOR JUNE, 1980.
PHILADELPHIA ELECTRIC EDDYSTONE 2 RETROFIT 334.0 MW (GROSS) 334.0 MW (ESC) COAL 2.50 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/80	EDDYSTONE 2 OF PHILADELPHIA ELECTRIC IS A 2.5% SULFUR COAL FIRED BOILER LOCATED IN EDDYSTONE, PENNSYLVANIA. THE PLANT'S GENERATING CAPACITY IS 334 MW. A CONTRACT HAS BEEN AWARDED TO UNITED ENGINEERS FOR A MAGNESIUM OXIDE FGD SYSTEM. THE START UP DATE IS SET FOR JUNE, 1980
POTOMAC ELECTRIC POWER DICKERSON 4 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL 2.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	DICKERSON 4 OF POTOMAC ELECTRIC POWER IS A PULVERIZED COAL (2.0% S, 11,000 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN DICKERSON, MARYLAND. THE UTILITY IS CONSIDERING AN FGD SYSTEM FOR THIS UNIT, BUT THERE ARE NO FIRM PLANS FOR THE INSTALLATION OF AN FGD SYSTEM. START UP OF THE BOILER IS EXPECTED IN 1985. FGD SYSTEM START UP, IF ANY, WILL BE IN 1987.
POWER AUTHORITY OF NEW YORK ARTHUR KILL NEW 700.0 MW (GROSS) 700.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 11/87	THE POWER AUTHORITY OF NEW YORK PLANS A NEW 3.0% SULFUR COAL FIRED UNIT WHICH WILL BE LOCATED AT THE ARTHUR KILL FACILITY ON STATEN ISLAND. THE UTILITY IS PRESENTLY CONSIDERING FGD SYSTEMS FOR THIS UNIT. PUBLIC SERVICE COMMISSION HEARINGS ARE CURRENTLY IN PROGRESS. START UP IS EXPECTED IN NOVEMBER, 1987.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PUBLIC SERVICE OF INDIANA GIBSON 5 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 3.30 %S LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	GIBSON 5 OF PUBLIC SERVICE OF INDIANA IS A 3.3% SULFUR COAL FIRED UNIT PLANNED FOR LOCATION IN PRINCETON, INDIANA. A CONTRACT WAS AWARDED TO PULLMAN KELLOGG FOR A LIMESTONE FGD SYSTEM CONSISTING OF FOUR KELLOGG-WEIR ABSORBER-REACTOR MODULES. SYSTEM START UP IS EXPECTED IN 1982. THE SYSTEM WILL USE KELLOGG'S PROPRIETARY MAGNESIUM-PROMOTED LIMESTONE.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 1 RETROFIT 361.0 MW (GROSS) 361.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 4.4% STATUS 1 STARTUP 4/78	SAN JUAN 1 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE APRIL OF 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 2 RETROFIT 350.0 MW (GROSS) 350.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 8/78	SAN JUAN 2 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE AUGUST OF 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 3 NEW 534.0 MW (GROSS) 534.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 12/79	SAN JUAN 3 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO UNDER CONSTRUCTION IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM BEING SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS WILL FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER WILL BOOST THE GAS TEMPERATURE 50 DEG F. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP IS EXPECTED IN DECEMBER, 1979.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 4 NEW 534.0 MW (GROSS) 534.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/82	SAN JUAN 4 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO UNDER CONSTRUCTION IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM BEING SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS WILL FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER WILL BOOST THE GAS TEMPERATURE 50 DEG F. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP IS EXPECTED IN JANUARY, 1982
SALT RIVER PROJECT CORONADO 1 NEW 350.0 MW (GROSS) 280.0 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 11/79	SALT RIVER PROJECT'S CORONADO 1 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG IS SUPPLYING TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH WILL REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS WILL PROVIDE REHEAT. THE WATER LOOP WILL BE OPEN, AND THE UNSTABILIZED SLUDGE WILL BE DISPOSED IN AN UNLINED POND. START UP IS EXPECTED IN NOVEMBER, 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SALT RIVER PROJECT CORONADO 2 NEW 350.0 MW (GROSS) 280.0 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/80	SALT RIVER PROJECT'S CORONADO 2 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG IS SUPPLYING TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH WILL REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS WILL PROVIDE REHEAT. THE WATER LOOP WILL BE OPEN, AND THE UNSTABILIZED SLUDGE WILL BE DISPOSED IN AN UNLINED POND. START UP IS EXPECTED IN JANUARY, 1980.
SALT RIVER PROJECT CORONADO 3 NEW 350.0 MW (GROSS) 280.0 MW (ESC) COAL 1.00 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/84	CORONADO 3 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED UNIT PLANNED BY SALT RIVER PROJECT TO BE LOCATED IN ST. JOHN'S, ARIZONA. THE UTILITY IS PRESENTLY CONSIDERING THE INSTALLATION OF TWO HORIZONTAL SPRAY TOWERS UTILIZING LIMESTONE AS THE ABSORBENT. PLANS FOR AN EMISSION CONTROL SYSTEM HAVE NOT BEEN FINALIZED. THE SYSTEM WILL HAVE A 20% BYPASS REHEAT, AND THE SLUDGE WILL PROBABLY BE PONDED. SCHEDULED OPERATION DATE IS 1984.
SAN MIGUEL ELECTRIC COOP SAN MIGUEL 1 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL 1.70 %S LIGNITE LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 5.0% STATUS 2 STARTUP 7/80	SAN MIGUEL 1 OF THE SAN MIGUEL ELECTRIC COOP IS A LIGNITE (1.7% S, 5000 BTU/LB) FIRED RADIANT BOILER UNDER CONSTRUCTION IN SAN MIGUEL, TEXAS. THE EMISSION CONTROL SYSTEM ON THIS UNIT WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY FOUR BABCOCK AND WILCOX 86% EFFICIENT LIMESTONE TCA MODULES. CHEVRON MIST ELIMINATORS WILL PRECEDE AN IN-LINE REHEATER AND AN ACID BRICK LINED STACK. THE WATER LOOP WILL BE CLOSED, AND THE DEWATERED SLURRY WILL BE MIXED WITH FLYASH BY RESEARCH COTTRELL AND DISPOSED IN AN OFF SITE LANDFILL.
SEMINOLE ELECTRIC SEMINOLE 1 NEW 620.0 MW (GROSS) 620.0 MW (ESC) COAL 2.75 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/83	SEMINOLE 1 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE SYSTEM. START UP IS EXPECTED IN JUNE OF 1983.
SEMINOLE ELECTRIC SEMINOLE 2 NEW 620.0 MW (GROSS) 620.0 MW (ESC) COAL 2.75 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/85	SEMINOLE 2 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE SYSTEM. START UP IS EXPECTED IN JUNE OF 1985.
SIKESTON BOARD OF MUNIC. UTIL. SIKESTON 1 NEW 235.0 MW (GROSS) 235.0 MW (ESC) COAL 2.80 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.6% STATUS 2 STARTUP 1/81	THE SIKESTON BOARD OF MUNICIPAL UTILITIES' SIKESTON 1 IS A PULVERIZED COAL (2.8% S, 11,340 BTU/LB) FIRED BOILER UNDER CONSTRCTION IN SIKESTON, MISSOURI. BABCOCK AND WILCOX IS SUPPLYING AN EMISSION CONTROL SYSTEM CONSISTING OF TWO ESP'S AND THREE 50% CAPACITY LIMESTONE VENTURI FGD MODULES. THE CLEANED GAS WILL PASS THROUGH CHEVRON MIST ELIMINATORS BEFORE EXITING A 450 FOOT FRP LINED FLUE (A SECOND CARBON STEEL LINED FLUE, USED FOR EMERGENCY BYPASS, IS ALSO IN THE STACK). THE WATER LOOP WILL BE OPEN, AND THE SLUDGE WILL BE PONDED. START UP IS SLATED FOR JANUARY, 1981.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SOUTH CAROLINA PUBLIC SERVICE WINYAH 2 NEW 280.0 MW (GROSS) 140.0 MW (ESC) COAL 1.70 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.1% STATUS 1 STARTUP 7/77	WINYAH 2 OF SOUTH CAROLINA PUBLIC SERVICE IS A PULVERIZED BITUMINOUS COAL (1.70% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN GEORGETOWN, SOUTH CAROLINA. A COLD SIDE ESP AND A BABCOCK AND WILCOX VENTURI SCRUBBER/LIMESTONE TRAY TOWER ABSORBER TRAIN DESIGNED TO REMOVE 69% OF THE SO2 FROM THE BOILER FLUE GAS MAKE UP THE EMISSION CONTROL SYSTEM ON THIS UNIT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY OF 1977.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 3 NEW 280.0 MW (GROSS) 280.0 MW (ESC) COAL 1.70 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.1% STATUS 2 STARTUP 5/80	WINYAH 3 IS A DRY BOTTOM BOILER UNDER CONSTRUCTION BY SOUTH CAROLINA PUBLIC SERVICE WHICH WILL BURN 1.7% SULFUR COAL (11,500 BTU/LB) IN GEORGETOWN, SOUTH CAROLINA. AN ESP WILL PRECEDE A BABCOCK AND WILCOX LIMESTONE FGD SYSTEM AND AN INDIRECT STEAM REHEATER. THE WATER LOOP WILL BE CLOSED. EXPECTED START UP DATE IS MAY, 1980.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 4 NEW 280.0 MW (GROSS) 280.0 MW (ESC) COAL 1.70 %S BITUMINOUS LIMESTONE AMERICAN AIR FILTER ENERGY CONSUMPTION: 2.1% STATUS 3 STARTUP 5/81	SOUTH CAROLINA PUBLIC SERVICE'S WINYAH 4 IS A PLANNED BITUMINOUS COAL (1.7% S, 11,500 BTU/LB) FIRED UNIT TO BE LOCATED IN GEORGETOWN, SOUTH CAROLINA. TWO AMERICAN AIR FILTER LIMESTONE SLURRY SPRAY TOWERS WILL FOLLOW AN ESP. THE TEMPERATURE OF THE CLEANED GAS WILL BE RAISED BY AN INDIRECT STEAM REHEATER. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. THE CONTRACT FOR THE FGD SYSTEM HAS BEEN AWARDED, AND START UP IS EXPECTED IN MAY, 1981.
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW 1 NEW 200.0 MW (GROSS) 124.0 MW (ESC) COAL 1.30 %S LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 5.5% STATUS 1 STARTUP 8/78	R.D. MORROW 1 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST OF 1978.
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW 2 NEW 200.0 MW (GROSS) 124.0 MW (ESC) COAL 1.30 %S LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 5.5% STATUS 1 STARTUP 6/79	R.D. MORROW 2 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE OF 1979.
SOUTHERN ILLINOIS POWER COOP MARION 4 NEW 184.0 MW (GROSS) 184.0 MW (ESC) COAL 3.50 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/79	UNIT 4 AT SOUTHERN ILLINOIS POWER COOP'S MARION STATION IN MARION, ILLINOIS IS A CYCLONE FIRED COAL (3.0% S, 9000 BTU/LB) BOILER WHICH IS SERVED BY A 89.4% EFFICIENT (DESIGN) LIMESTONE FGD SYSTEM SUPPLIED BY BABCOCK AND WILCOX. TWO SPRAY TOWERS AND A BRICK LINED STACK ARE DOWNSTREAM OF AN ESP IN THIS SYSTEM. THE WATER LOOP IS OPEN, AND THE FLYASH STABILIZED SLUDGE IS DEWATERED AND LANDFILLED. THE SYSTEM BECAME OPERATIONAL DURING MAY OF 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SOUTHERN ILLINOIS POWER COOP MARION 5 NEW 300.0 MW (GROSS) 300.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/84	MARION 5 IS A COAL (3.0% S, 9000 BTU/LB) FIRED UNIT PLANNED BY SOUTHERN ILLNOIS POWER COOP FOR LOCATION IN MARION, ILLINOIS. THE UTILITY HAS NOT YET DECIDED ON AN FGD PROCESS AS IT IS WAITING FOR THE FINALIZATION OF THE SO2 REGULATIONS THE UNIT WILL HAVE TO MEET. START UP IS EXPECTED IN 1984.
SOUTHERN INDIANA GAS & ELEC A.B. BROWN 1 NEW 265.0 MW (GROSS) 265.0 MW (ESC) COAL 4.50 %S DUAL ALKALI FMC CORPORATION ENERGY CONSUMPTION: .8% STATUS 1 STARTUP 3/79	SOUTHERN INDIANA GAS AND ELECTRIC'S A.B.BROWN 1 IS A DRY BOTTOM PULVERIZED COAL (4.5% S, 13,010 BTU/LB) FIRED UNIT IN WEST FRANKLIN, INDIANA. FMC SUPPLIED A DUAL ALKALI FGD SYSTEM DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. THE UNIT CONSISTS OF TWO THREE STAGE DISC CONTACTORS. A COLD SIDE ESP PROVIDES PRIMARY PARTICULATE CONTROL, AND ONE CHEVRON MIST ELIMINATOR/MODULE PRECEDES A 498 FOOT ACID BRICK LINED STACK. THE SYSTEM PRODUCES A FILTER LAKE WASTE PRODUCT WHICH IS DISPOSED IN AN ON SITE LANDFILL. THE WATER LOOP CAN BE EITHER OPEN OR CLOSED. THE SYSTEM HAS BEEN OPERATIONAL SINCE MARCH OF 1979.
SOUTHWESTERN ELECTRIC POWER HENRY W. PERKEY 1 NEW 720.0 MW (GROSS) 720.0 MW (ESC) COAL .80 %S LIGNITE LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 12/83	HENRY W. PERKEY 1 IS A WET BOTTOM LIGNITE (0.8% S, 6300 BTU/LB) FIRED UNIT PLANNED BY SOUTHWESTERN ELECTRIC POWER FOR LOCATION IN HALLSVILLE, TEXAS. A CONTRACT HAS BEEN AWARDED TO THE AIR CORRECTION DIVISION OF UOP FOR FOUR LIMESTONE SPRAY TOWERS (99+% EFFICIENCY). MIST ELIMINATION WILL BE PROVIDED BY TWO STAGE CHEVRONS, AND THE STACK WILL BE ACID BRICK LINED. NO REHEAT IS PLANNED. THE WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE POZ-O-TEC STABILIZED. START UP IS EXPECTED BY DECEMBER, 1983.
SPRINGFIELD CITY UTILITIES SOUTHWEST 1 NEW 194.0 MW (GROSS) 194.0 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 4/77	SPRINGFIELD CITY UTILITIES' SOUTHWEST 1 IS A PULVERIZED BITUMINOUS COAL (3.5% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN SPRINGFIELD, MISSOURI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY TWO UOP LIMESTONE TCA MODULES WHICH WERE DESIGNED TO REMOVE 80% OF THE FLUE GAS SO2. ONE CHEVRON/MODULE LEADS TO A 384 FOOT CEILCOTE LINED STACK. THE DRY FLYASH STABILIZED SLUDGE IS DEWATERED BY A ROTARY DRUM VACUUM AND TRUCKED TO A LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1977.
SPRINGFIELD WATER, LIGHT & PWR DALLMAN 3 NEW 205.0 MW (GROSS) 205.0 MW (ESC) COAL 3.30 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 5.9% STATUS 2 STARTUP 7/80	DALLMAN 3 OF SPRINGFIELD WATER, LIGHT, AND POWER IS A PULVERIZED COAL (3.3% S, 10,500 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SPRINGFIELD, ILLINOIS. RESEARCH COTTRELL IS SUPPLYING A LIMESTONE FGD SYSTEM DESIGNED TO REMOVE 95% OF THE SO2 FROM 850,000 ACFM OF BOILER FLUE GAS. A HOT SIDE ESP WILL PRECEDE TWO PACKED TOWER ABSORBERS, ONE HORIZONTAL CHEVRON PER MODULE, AND A 500 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE PROVIDED. A SLLDGE DISPOSAL STRATEGY HAS NOT BEEN FINALIZED, BUT THE UTILITY IS CONSIDERING EITHER PONDING OR LANDFILL. FGD OPERATIONS SHOULD BEGIN IN JULY OF 1980.
ST. JOE ZINC G.F. WEATON 1 RETROFIT 60.0 MW (GROSS) 60.0 MW (ESC) COAL 3.00 %S CITRATE BUREAU OF MINES ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 11/79	G.F. WEATON 1, OWNED BY ST. JOE ZINC, IS A COAL (3.0% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN MONACA, PENNSYLVANIA. THE BUREAU OF MINES IS RETROFITTING A PROTOTYPE CITRATE FGD SYSTEM ON THIS UNIT, WHICH PROVIDES POWER FOR THE LOCAL UTILITY GRID. ONE VENTURI SCRUBBER/ABSORBER TRAIN WILL FOLLOW A COLD SIDE ESP. TWO CHEVRON MIST ELIMINATORS ARE TO BE FOLLOWED BY A COMBINATION OF INDIRECT HOT AIR AND DIRECT COMBUSTION REHEATERS, AND A 102 FOOT FIBERGLASS LINED SCRUBBER STACK. THE SYSTEM SO2 REMOVAL EFFICIENCY WILL BE OVER 90%. THE WATER LOOP WILL BE CLOSED. THE FGD SYSTEM IS CURRENTLY UNDER CONSTRUCTION, WITH START UP EXPECTED IN NOVEMBER OF 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TAMPA ELECTRIC BIG BEND 4 NEW 475.0 MW (GROSS) 475.0 MW (ESC) COAL 85.03 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 3/85	UNIT 4 AT TAMPA ELECTRIC'S BIG BEND STATION IS A PLANNED DRY BOTTOM PULVERIZED COAL (2.5% S, 10,300 BTU/LB) FIRED UNIT TO BE LOCATED IN TAMPA, FLORIDA. THE FGD PROCESS HAS NOT YET BEEN CHOSEN. AN ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM, WHICH WILL REMOVE 90% OF THE FLUE GAS SO2, WILL INCLUDE AN INDIRECT HOT AIR REHEATER LEADING TO A 490 FOOT CONCRETE LINED STACK.
TENNESSEE VALLEY AUTHORITY JOHNSONVILLE 1-10 RETROFIT 1450.0 MW (GROSS) 600.0 MW (ESC) COAL 3.10 %S MAGNESIUM OXIDE TVA/UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/82	UNITS 1 THROUGH 10 AT JOHNSONVILLE STATION OF TVA ARE COAL (2.6% S, 10,750 BTU/LB) FIRED BOILERS LOCATED IN NEW JOHNSONVILLE, TENNESSEE. UNITED ENGINEERS HAS BEEN AWARDED A CONTRACT TO PROVIDE ENGINEERING ASSISTANCE TO TVA FOR A 90% EFFICIENT MAGNESIUM OXIDE FGD SYSTEM TO BE RETROFITTED ON THESE UNITS. SULFURIC ACID WILL BE PRODUCED AS A BYPRODUCT FROM THIS SYSTEM, WHICH WILL FEATURE FOUR VENTURI SCRUBBER/ABSORBER TRAINS (ONE SPARE), 60% BYPASS REHEAT, AND A 600 FOOT STACK. START UP IS EXPECTED IN 1982.
TENNESSEE VALLEY AUTHORITY PARADISE 1 RETROFIT 704.0 MW (GROSS) 704.0 MW (ESC) COAL ***** %S LIMESTONE CHEMICO ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/82	PARADISE 1 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILLABLE GRADE SLUDGE. OPERATIONS SHOULD START IN JUNE, 1982. -NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--N
TENNESSEE VALLEY AUTHORITY PARADISE 2 RETROFIT 704.0 MW (GROSS) 704.0 MW (ESC) COAL 4.20 %S LIMESTONE CHEMICO ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/82	PARADISE 2 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILLABLE GRADE SLUDGE. OPERATIONS SHOULD START IN MARCH, 1982. -NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--N
TENNESSEE VALLEY AUTHORITY SHAWNEE 10A RETROFIT 10.0 MW (GROSS) 10.0 MW (ESC) COAL 2.90 %S BITUMINOUS LIME/LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/72	SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10A IS A RETROFIT PROTOTYPE LIME/LIMESTONE TCA SYSTEM SUPPLIED BY THE AIR CORRECTION DIVISION, UOP. THE SYSTEM UTILIZES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1972.
TENNESSEE VALLEY AUTHORITY SHAWNEE 10B RETROFIT 10.0 MW (GROSS) 10.0 MW (ESC) COAL 2.90 %S BITUMINOUS LIME/LIMESTONE CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/72	SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10B IS A RETROFIT PROTOTYPE LIME/LIMESTONE VENTURI SCRUBBER/SPRAY TOWER ABSORBER SUPPLIED BY CHEMICO. THE SYSTEM, OPERATIONAL SINCE APRIL, 1972, INCLUDES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER. -NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--NULL--N

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 7 RETROFIT 575.0 MW (GROSS) 575.0 MW (ESC) COAL 3.70 %S BITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	WIDOWS CREEK 7 IS A PULVERIZED BITUMINOUS COAL (3.7% S, 11,100 BTU/LB) FIRED BOILER OF TVA LOCATED IN BRIDGEPORT, ALABAMA. COMBUSTION ENGINEERING IS PRESENTLY RETROFITTING A LIMESTONE VENTRI ROD SCRUBBER/SPRAY TOWER ABSORBER FGD SYSTEM ON THIS UNIT. AN ESP WILL PRECEDE THE SCRUBBING TRAIN, AND A COMBINATION OF A BULK ENTRAINMENT SEPARATOR, TWO CHEVRON MIST ELIMINATORS AND A FINNED TUBE REHEATER FOLLOW THE SYSTEM. THE SCRUBBER SLUDGE WILL BE DISPOSED IN A SLUDGE POND. CONSTRUCTION BEGAN IN SEPTEMBER, 1978, AND START UP IS EXPECTED IN OCTOBER, 1980.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 8 RETROFIT 550.0 MW (GROSS) 550.0 MW (ESC) COAL 3.70 %S LIMESTONE TENNESSEE VALLEY AUTHORITY ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/77	WIDOWS CREEK 8 OF TVA IS A BALANCED DRAFT, TANGENTIALLY FIRED COAL (4.3% S, 10,000 BTU/LB) BOILER IN BRIDGEPORT, ALABAMA. TVA RETROFITTED THIS UNIT WITH A LIMESTONE FGD SYSTEM (80% DESIGN SO2 REMOVAL EFFICIENCY) WHICH BEGAN OPERATIONS IN MAY, 1977. AN ESP PRECEDES FOUR VARIABLE THROAT VENTURI SCRUBBER/MULTIGRID TOWER ABSORBER TRAINS (ONE OF THE TOWERS IS PACKED). ONE VERTICAL CHEVRON/TRAIN AND AN INDIRECT HOT AIR REHEATER ARE INCLUDED IN THE SYSTEM. SLUDGE FROM THE FGD SYSTEM IS PONDED.
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK 1 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL 1.06 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/82	GIBBONS CREEK 1 OF THE TEXAS MUNICIPAL POWER AGENCY IS A DRY BOTTOM PULVERIZED LIGNITE (1.06% S, 4860 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN CARLOS, TEXAS. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY THREE 50% CAPACITY LIMESTONE SPRAY TOWERS. A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR THE FGD SYSTEM, WHICH INCLUDES A CHEVRON MIST ELIMINATOR AND A STEAM COIL REHEATER. CLEANED FLUE GAS WILL BE DISCHARGED THROUGH A 465 FOOT ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS STRIP MINE LANDFILL. CONSTRUCTION WILL BEGIN IN 1980, AND START UP IS EXPECTED IN JANUARY, 1982.
TEXAS POWER & LIGHT SANDOW 4 NEW 545.0 MW (GROSS) 382.0 MW (ESC) COAL 1.60 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/80	SANDOW 4 IS A PULVERIZED 1.6% SULFUR LIGNITE FIRED BOILER OF TEXAS POWER AND LIGHT UNDER CONSTRUCTION IN ROCKDALE, TEXAS. COMBUSTION ENGINEERING IS SUPPLYING THREE LIMESTONE SPRAY TOWERS FOR THIS UNIT. A COLD SIDE ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. A 30% BYPASS REHEAT WILL BE USED, AND THE OVERALL SO2 REMOVAL EFFICIENCY WILL BE 75%. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE SLUDGE WILL BE PONDED. START UP IS EXPECTED IN JULY, 1980.
TEXAS POWER & LIGHT TWIN OAKS 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .70 %S LIGNITE LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 8/84	TWIN OAKS 1 IS A 0.75% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. BIDS ARE PRESENTLY BEING EVALUATED FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST OF 1984.
TEXAS POWER & LIGHT TWIN OAKS 2 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .70 %S LIGNITE LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 8/85	TWIN OAKS 2 IS A 0.75% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. BIDS ARE PRESENTLY BEING EVALUATED FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST OF 1985.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TEXAS UTILITIES FOREST GROVE 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .80 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/81	TEXAS UTILITIES IS PLANNING A LIGNITE (0.8% S, 7000 BTU/LB) FIRED BOILER, FOREST GROVE 1, WHICH WILL BE LOCATED IN ATHENS, TEXAS. THE UTILITY IS PRESENTLY REQUESTING BIDS ON AN FGD SYSTEM FOR THIS UNIT. TWO ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL, AND NO STACK GAS REHEAT IS PLANNED. START UP IS EXPECTED IN LATE 1981.
TEXAS UTILITIES MARTIN LAKE 1 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE NONE ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 4/77	TEXAS UTILITIES' MARTIN LAKE 1 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN APRIL, 1977.
TEXAS UTILITIES MARTIN LAKE 2 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 5/78	TEXAS UTILITIES' MARTIN LAKE 2 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN MAY, 1978.
TEXAS UTILITIES MARTIN LAKE 3 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 2/79	TEXAS UTILITIES' MARTIN LAKE 3 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN FEBRUARY, 1979.
TEXAS UTILITIES MARTIN LAKE 4 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/85	MARTIN LAKE 4 OF TEXAS UTILITIES IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN TATUM, TEXAS. A CONTRACT FOR A LIMESTONE FGD SYSTEM FOR THIS UNIT HAS BEEN AWARDED TO RESEARCH COTTRELL. CONSTRUCTION HAS NOT YET BEGUN ON THE FGD SYSTEM. FGD START UP IS EXPECTED IN 1985 OR 1986.
TEXAS UTILITIES MILL CREEK 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	MILL CREEK 1 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL. START UP IS EXPECTED IN 1985.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TEXAS UTILITIES MILL CREEK 2 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	MILL CREEK 2 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL. START UP IS EXPECTED IN 1986.
TEXAS UTILITIES MONTICELLO 3 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL 1.50 %S LIGNITE LIMESTONE CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/78	MONTICELLO 3 OF TEXAS UTILITIES IS A LIGNITE (1.5% S, 7000 BTU/LB) FIRED UNIT IN MT. PLEASANT, TEXAS. THIS UNIT'S EMISSION CONTROL SYSTEM CONSISTS OF TWO COLD SIDE ESP'S FOLLOWED BY THREE CHEMICO LIMESTONE SPRAY TOWERS (74% DESIGN SO2 REMOVAL EFFICIENCY), ONE HORIZONTAL CHEVRON MIST ELIMINATOR/MODULE, AND AN INDIRECT HOT AIR REHEATER. THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS DISPOSED IN AN ON SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE MAY OF 1978.
UTAH POWER & LIGHT HUNTER 1 NEW 400.0 MW (GROSS) 360.0 MW (ESC) COAL .55 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/79	HUNTER 1 OF UTAH POWER AND LIGHT IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT IN CASTLEDALE, UTAH. CHEMICO SUPPLIED A PEBBLE LIME WET SCRUBBING SYSTEM WHICH BECAME OPERATIONAL IN MAY, 1979. THE SCRUBBING SYSTEM IS DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO2 REMOVAL EFFICIENCY OF 80%. PRIMARY PARTICULATE CONTROL IS PROVIDED BY AN UPSTREAM ESP, AND STACK GAS REHEAT IS PROVIDED BY BYPASS. THE SLUDGE IS FLYASH STABILIZED AND DISPOSED ON-SITE.
UTAH POWER & LIGHT HUNTER 2 NEW 400.0 MW (GROSS) 360.0 MW (ESC) COAL .55 %S LIME CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	UTAH POWER AND LIGHT'S HUNTER 2 IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN CASTLEDALE, UTAH. CHEMICO IS SUPPLYING A PEBBLE LIME WET SCRUBBING SYSTEM DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO2 REMOVAL EFFICIENCY OF 80%. AN UPSTREAM ESP PROVIDES PRIMARY PARTICULATE CONTROL, AND A BYPASS SYSTEM PROVIDES STACK GAS REHEAT. THE SLUDGE WILL BE FLYASH STABILIZED AND DISPOSED ON-SITE. START UP OF BOTH THE BOILER AND FGD SYSTEM IS EXPECTED IN JUNE, 1980.
UTAH POWER & LIGHT HUNTINGTON 1 NEW 430.0 MW (GROSS) 366.0 MW (ESC) COAL .55 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 5/78	HUNTINGTON 1 OF UTAH POWER IS A TANGENTIALLY FIRED PULVERIZED COAL (0.55% S, 12,500 BTU/LB) BOILER IN PRICE, UTAH. A COLD SIDE ESP TREATS 1,742,000 ACFM OF FLUE GAS AND IS FOLLOWED BY A CHEMICO LIME FGD SYSTEM CONSISTING OF FOUR SPRAY TOWERS (80% DESIGN EFFICIENCY). ONE FOUR PASS CHEVRON/MODULE PROVIDES MIST ELIMINATION, AND A COMBINATION OF A STEAM TUBE AND 10-20% BYPASS REHEATERS BOOST THE GAS TEMPERATURE 45-50 DEG F. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE FLYASH STABILIZED SLUDGE IS TRUCKED TO AN ON-SITE LANDFILL. THE SYSTEM INCLUDES A 600 FOOT ACID BRICK LINED STACK, AND HAS BEEN OPERATIONAL SINCE MAY OF 1978.
WISCONSIN POWER & LIGHT COLUMBIA 2 RETROFIT 527.0 MW (GROSS) 316.0 MW (ESC) COAL .80 %S LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/82	UNIT 2 AT WISCONSIN POWER AND LIGHT'S COLUMBIA STATION IN PORTAGE, WISCONSIN IS A PULVERIZED COAL (0.8% S, 8600 BTU/LB) FIRED BOILER WHICH BEGAN OPERATIONS IN 1978. CHEMICO HAS BEEN AWARDED A CONTRACT FOR A RETROFIT LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF TWO SPRAY TOWER ABSORBERS, A HORIZONTAL CHEVRON MIST ELIMINATOR AND 20% BYPASS REHEAT. A HOT SIDE ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. THE CLEANED GAS WILL BE DISCHARGED THROUGH A 650 FOOT GUNITE COATED CARBON STEEL LINED STACK. THE WATER LOOP WILL BE CLOSED, AND THE LIME AND FLYASH STABILIZED SLUDGE WILL BE LANDFILLED. CONSTRUCTION SHOULD BEGIN AROUND MARCH OF 1980, AND PROJECTED FGD SYSTEM START UP DATE IS JANUARY, 1982.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
----------------------------------------------------------------------------------------------------------

COMPANY NAME                                        ALABAMA ELECTRIC COOP
PLANT NAME                                          TOMBIGBEE
UNIT NUMBER                                         2
CITY                                                LEROY
STATE                                               ALABAMA
GROSS UNIT GENERATING CAPACITY - MW                   255.0
NET UNIT GENERATING CAPACITY W/FGD - MW               235.0
EQUIVALENT SCRUBBED CAPACITY - MW                     179.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       26749.         ( 11500 BTU/LB)
    AVERAGE ASH CONTENT - %                            14.00
    AVERAGE MOISTURE CONTENT - %                        7.00
    AVERAGE SULFUR CONTENT - %                          1.15
    AVERAGE CHLORIDE CONTENT - %                    ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    LIMESTONE
    SYSTEM SUPPLIER                                 PEABODY PROCESS SYSTEMS
    NEW/RETROFIT                                    NEW
    ENERGY CONSUMPTION - %                              3.1
    INITIAL START-UP DATE                            9/78
    COMMERCIAL START-UP DATE                        **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                  85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.30
    ABSORBER SPARE CAPACITY INDEX - %                    .0
    ABSORBER SPARE COMPONENTS INDEX                      .0

** WATER LOOP
    TYPE                                            OPEN
    FRESH MAKE-UP WATER - LITER/S                      17.6         (  280 GPM)

** DISPOSAL
    TYPE                                            LINED POND


-----------------------------------------PERFORMANCE DATA------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 9/78  A
       B
       SYSTEM     81.4         81.4        81.4        81.4                   720   183    149

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  9/78         END DATE  9/78
                      INITIAL OPERATION OF THE FGD SYSTEM BEGAN ON SEPTEMBER 23.                    X

10/78  A
       B
       SYSTEM     66.3         57.9        57.9        46.4                   744   596    345

11/78  A
       B
       SYSTEM     88.9         88.4        88.4        83.9                   720   683    604

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE 10/78         END DATE 11/78
                      IN LATE OCTOBER AND EARLY NOVEMBER BREAKS WERE FOUND IN THE FIBERGLASS      R
                      PIPING LEADING TO AND FROM THE DISPOSAL POND.  THE PROBLEMS WERE QUICKLY
                      CORRECTED BY THE ARCHITECT/ENGINEER.

12/78  A
```

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B										
	SYSTEM	97.8	97.6	97.6	91.8			744	700	683	
1/79	A										
	B										
	SYSTEM	89.2	89.2	89.2	89.0			744	742	662	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 1/79 END DATE 1/79
SOME PLUGGING WAS ENCOUNTERED IN THE MIST ELIMINATOR DUE TO AN ESP OLTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	A										
	B										
	SYSTEM	98.4	96.2	96.2	42.6			672	297	286	
3/79	A										
	B										
	SYSTEM	94.5	94.4	94.4	93.5			744	737	696	
4/79	A										
	B										
	SYSTEM	100.0	100.0	100.0	40.6			720	292	292	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
THE UTILITY HAS REPORTED THAT NO UNUSUAL PROBLEMS HAVE OCCURRED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	A										
	B										
	SYSTEM	92.7	92.6	92.6	90.2			744	725	671	
6/79	A										
	B										
	SYSTEM	98.3	96.9	96.9	52.6			720	391	379	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 6/79
THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WELL DURING MAY AND JUNE WITH THE EXCEPTION THAT THE MIST ELIMINATORS HAD TO BE REPLACED. THE MIST ELIMINATORS WERE DEFORMED DURING A TEMPERATURE EXCURSION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	A										
	B										
	SYSTEM	93.0	91.1	91.1	71.9			744	587	535	
8/79	A										
	B										
	SYSTEM	99.2	92.3	92.3	70.2			744	566	522	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 8/79 END DATE 8/79
THE SCRUBBER WAS NOT OPERATED FOR ABOUT 6 HOURS DUE TO A NECESSARY ADJUSTMENT TO THE MODICON CONTROLLER.

START DATE 8/79 END DATE 8/79
THE SCRUBBER WAS BYPASSED FOR ABOUT 37 HOURS DUE TO AN ESP OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	A		83.2		68.3						
	B		21.8		17.9						
	SYSTEM	100.0	92.9	92.9	76.3			720	591	549	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 9/79 END DATE 9/79
THE UTILITY REPORTED THAT THE SYSTEM WAS AVAILABLE AT ALL TIMES DURING SEPTEMBER.

```
                                SECTION 3
              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------
  COMPANY NAME                                  ALABAMA ELECTRIC COOP
  PLANT NAME                                    TOMBIGBEE
  UNIT NUMBER                                   3
  CITY                                          LEROY
  STATE                                         ALABAMA
  REGULATORY CLASSIFICATION                     A
  PARTICULATE EMISSION LIMITATION - NG/J        ******         (****** LB/MMBTU)
  SO2 EMISSION LIMITATION - NG/J                  516.         ( 1.200 LB/MMBTU)
  NET PLANT GENERATING CAPACITY - MW            *******
  GROSS UNIT GENERATING CAPACITY - MW             255.0
  NET UNIT GENERATING CAPACITY W/FGD - MW         235.0
  NET UNIT GENERATING CAPACITY WO/FGD - MW        243.0
  EQUIVALENT SCRUBBED CAPACITY - MW               179.0

 ** BOILER DATA
     SUPPLIER                                   RILEY STOKER
     TYPE                                       PULVERIZED COAL
     SERVICE LOAD                               BASE
     COMMERCIAL SERVICE DATE                     6/79
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        449.72       ( 953000 ACFM)
     FLUE GAS TEMPERATURE - C                     143.9        ( 291 F)
     STACK HEIGHT - M                             122.         ( 400 FT)
     STACK TOP DIAMETER - M                     *******        (***** FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                  26749.        ( 11500 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                11000-12000
     AVERAGE ASH CONTENT - %                         14.00
     RANGE ASH CONTENT - %                      10-16
     AVERAGE MOISTURE CONTENT - %                     7.00
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                       1.15
     RANGE SULFUR CONTENT - %                   0.8-1.5
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

 ** ESP
     NUMBER                                     1
     TYPE                                       HOT SIDE
     SUPPLIER                                   RESEARCH COTTRELL
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     99.3

 ** FGD SYSTEM
     SALEABLE PRODUCT/THROWAWAY PRODUCT         THROWAWAY PRODUCT
     GENERAL PROCESS TYPE                       WET SCRUBBING
     PROCESS TYPE                               LIMESTONE
     SYSTEM SUPPLIER                            PEABODY PROCESS SYSTEMS
     A-E FIRM                                   BURNS & MCDONNELL
     DEVELOPMENT LEVEL                          FULL SCALE
     NEW/RETROFIT                               NEW
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     99.30
     SO2 DESIGN REMOVAL EFFICIENCY - %             85.00
     INITIAL START-UP                           6/79
     CONTRACT AWARDED                           8/75
     ABSORBER SPARE CAPACITY INDEX - %               .0
     ABSORBER SPARE COMPONENT INDEX                  .0

 ** ABSORBER
     NUMBER                                     2
     TYPE                                       SIEVE TRAY TOWER
     INITIAL START UP                            6/79
     SHELL MATERIAL                             CARBON STEEL
     SHELL LINER MATERIAL                       RUBBER LINED
     BOILER LOAD/ABSORBER - %                      35.0
     LIQUID RECIRCULATION RATE - LITER/S         1259.         (15980 GPM)
     L/G RATIO - L/CU.M                              9.4       ( 73.0 GAL/1000ACF)
     SO2 DESIGN REMOVAL EFFICIENCY - %             85.0
```

ALABAMA ELECTRIC COOP: TOMBIGBEE 3 (CONT.)

```
** FANS
    NUMBER                                      1
    TYPE                                        ID, DIRECT COUPLED
    CONSTRUCTION MATERIALS                      CARBON STEEL

 ** MIST ELIMINATOR
     NUMBER                                     4
     TYPE                                       CHEVRON

 ** MIST ELIMINATOR
     NUMBER                                     2
     TYPE                                       BULK ENTRAINMENT SEPARATOR

 ** PUMPS
     SERVICE                                    NUMBER
     -------                                    ------
     RECYCLE                                       6
     MILL RECYCLE                                  2
     SLURRY FEED                                   2
     WASH WATER                                    3
     WASTE SLURRY                                  2
     SUPERNATE RETURN                              1

 ** TANKS
     SERVICE                                    NUMBER
     -------                                    ------
     RECYCLE                                       1
     LIMESTONE SLURRY                              1
     WASH WATER                                    1

 ** REHEATER
     NUMBER                                     1

 ** THICKENER
     NUMBER                                     1

 ** WATER LOOP
     TYPE                                       OPEN
     FRESH MAKEUP WATER ADDITION - LITERS/S        17.6        (  280 GPM)

 ** REAGENT PREPARATION EQUIPMENT
     NUMBER OF BALL MILLS                           1
     BALL MILL CAPACITY- M T/H                      9.1        ( 10.0 TPH)
     REAGENT PRODUCT - % SLURRY SOLIDS             35.0

 ** TREATMENT

 ** DISPOSAL
     NATURE                                     FINAL
     TYPE                                       LINED POND
     LOCATION                                   ON-SITE
     TRANSPORTATION                             PUMPED
     AREA - ACRES                                  34.8

----------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 7/79  A
       B
       SYSTEM      72.7        28.1        28.1        11.2                      744   295     83

 8/79  A
       B
       SYSTEM      99.7        63.7        63.7        41.9                      744   490    312

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  8/79        END DATE  8/79
                        AN ADJUSTMENT TO THE MODICON CONTROLLER CAUSED A SCRUBBER OUTAGE OF ABOUT
                        2 HOURS.

            START DATE  8/79        END DATE  8/79
```

PERFORMANCE DATA

THE SCRUBBER WAS DOWN DURING AN ESP OUTAGE FOR APPROXIMATELY 34 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	A		73.0		13.9						
	B		10.9		2.1						
	SYSTEM	100.0	75.2	75.2	14.3			720	137	103	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 9/79 END DATE 9/79

CONTINUING GENERATOR PROBLEMS CAUSED THE UNIT'S UTILIZATION TO BE LOW DURING SEPTEMBER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
COMPANY NAME                                      ALLEGHENY POWER SYSTEM
PLANT NAME                                        PLEASANTS
UNIT NUMBER                                       1
CITY                                              BELMONT
STATE                                             WEST VIRGINIA
REGULATORY CLASSIFICATION                         A
PARTICULATE EMISSION LIMITATION - NG/J              21.          (  .050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                     516.          ( 1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                1250.0
GROSS UNIT GENERATING CAPACITY - MW                625.0
NET UNIT GENERATING CAPACITY W/FGD - MW            625.0
NET UNIT GENERATING CAPACITY WO/FGD - MW         *******
EQUIVALENT SCRUBBED CAPACITY - MW                  519.0

** BOILER DATA
     SUPPLIER                                     ******
     TYPE                                         ******
     SERVICE LOAD                                 BASE
     COMMERCIAL SERVICE DATE                       0/79
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        1152.85        (2443000 ACFM)
     FLUE GAS TEMPERATURE - C                      132.2         ( 270 F)
     STACK HEIGHT - M                              366.          (1200 FT)
     STACK TOP DIAMETER - M                           .6         (  2.0 FT)

** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                    27912.        ( 12000 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                  11,000-13,300
     AVERAGE ASH CONTENT - %                      ********
     RANGE ASH CONTENT - %                        ******
     AVERAGE MOISTURE CONTENT - %                    15.00
     RANGE MOISTURE CONTENT - %                   10-20
     AVERAGE SULFUR CONTENT - %                       3.70
     RANGE SULFUR CONTENT - %                     2-4.5
     AVERAGE CHLORIDE CONTENT - %                 ********
     RANGE CHLORIDE CONTENT - %                   ******

** ESP
     NUMBER                                         1
     SUPPLIER                                     AIR CORRECTION DIVISION, UOP

** FGD SYSTEM
     SALEABLE PRODUCT/THROWAWAY PRODUCT           THROWAWAY PRODUCT
     GENERAL PROCESS TYPE                         WET SCRUBBING
     PROCESS TYPE                                 LIME
     PROCESS ADDITIVES                            MG/2-6%
     SYSTEM SUPPLIER                              BABCOCK & WILCOX
     A-E FIRM                                     UNITED ENGINEERS & CONSTRUCTORS
     CONSTRUCTION FIRM                            UNITED ENGINEERS & CONSTRUCTORS
     DEVELOPMENT LEVEL                            FULL SCALE
     NEW/RETROFIT                                 NEW
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.55
     SO2 DESIGN REMOVAL EFFICIENCY - %               90.00
     INITIAL START-UP                              3/79

** ABSORBER
     NUMBER                                         4
     TYPE                                         SPRAY TOWER
     INITIAL START UP                              3/79
     SUPPLIER                                     BABCOCK & WILCOX
     NUMBER OF STAGES                               1
     SHELL MATERIAL                               MILD CARBON STEEL
     SHELL LINER MATERIAL                         RUBBER
     INTERNAL MATERIAL                            SS
     BOILER LOAD/ABSORBER - %                        21.0
     GAS FLOW - CU.M/S                              242.10       ( 513030 ACFM)
     GAS TEMPERATURE - C                            132.2        (  270 F)
     L/G RATIO - L/CU.M                               7.4        ( 55.0 GAL/1000ACF)
     PRESSURE DROP - KPA                              1.2        ( 5.0 IN-H2O)
```

ALLEGHENY POWER SYSTEM: PLEASANTS 1 (CONT.)

** MIST ELIMINATOR

TYPE	CHEVRON	
CONSTRUCTION MATERIAL	FRP	

** REHEATER

TYPE	BYPASS	
TEMPERATURE BOOST - C	11.1	(20 F)

** WATER LOOP

TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 4/79
THE UNIT STARTED ON MARCH 7 1979. NO HOURS ARE YET AVAILABLE BECAUSE OF THE RECENT OPERATING STATUS.

START DATE 3/79 END DATE 4/79
A-MODULE HAS BEEN REMOVED FROM SERVICE DUE TO WELD FAILURE ON THE ABSORBER DOWNCOMER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 6/79 END DATE 6/79
THE UTILITY REPORTED THAT THE UNIT WAS TAKEN OUT OF SERVICE ON JUNE 19 DUE TO SEVERE STACK LINER FAILURE. THE UNIT IS PROJECTED TO BE OUT OF SERVICE UNTIL THE MIDDLE OF AUGUST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744	0		
8/79	SYSTEM							744	0		
9/79	SYSTEM							720	0		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79
THE UNIT RESTARTED IN LATE SEPT. AFTER COMPLETION OF THE STACK RELINING.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	ARIZONA ELECTRIC POWER COOP	
PLANT NAME	APACHE	
UNIT NUMBER	2	
CITY	COCHISE	
STATE	ARIZONA	
GROSS UNIT GENERATING CAPACITY - MW	195.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	175.0	
EQUIVALENT SCRUBBED CAPACITY - MW	195.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
AVERAGE ASH CONTENT - %	15.00	
AVERAGE MOISTURE CONTENT - %	9.00	
AVERAGE SULFUR CONTENT - %	.55	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH COTTRELL	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	4.1	
INITIAL START-UP DATE	8/78	
COMMERCIAL START-UP DATE	1/79	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	115.9	(1840 GPM)
** DISPOSAL		
TYPE	POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
COMPLIANCE TESTS WERE RUN ON THIS UNIT LAST NOVEMBER AND THE UNIT WAS DECLARED COMMERCIAL IN FEBRUARY. THE FGD SYSTEM OPERATES ONLY ABOUT 50 PERCENT OF THE BOILER HOURS BECAUSE THE UNIT OPERATES AT SUCH A LOW RATING 50 PERCENT OF THE TIME THAT THE FGD SYSTEM IS NOT NEEDED.

START DATE 2/79 END DATE 3/79
A BOILER EXPLOSION AT THE BURNER FACE CAUSED THE UNIT TO BE DOWN FROM THE LAST WEEK IN FEBRUARY THROUGH THE MIDDLE OF MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM							744			
6/79	SYSTEM							720			

```
-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER BOILER  FGD  CAP.
                                                                 SO2 PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE 6/79          END DATE   6/79
                         THE UTILITY REPORTED THAT THE UNIT ITSELF RAN WELL BUT WAS EXPERIENCING
                         FAILURE OF THE FRP REAGENT FEED PIPELINE.  THE PIPING IS NOW BEING RE-
                         PLACED WITH CARBON STEEL.

 7/79  SYSTEM                                                                744

 8/79  SYSTEM                                                                744

 9/79  SYSTEM                                                                720

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE 7/79          END DATE   9/79
                         DURING THE THIRD QUARTER THE UNIT ONLY OPERATED ABOUT 25% OF THE TIME
                         BECAUSE OF CONTINUING PROBLEMS WITH THE REAGENT FEED LINE.  THE SECTION
                         FROM THE GRINDER TO THE SCRUBBERS WAS FRP AND IT FAILED.  THE LINE WAS
                         REPAIRED AT THE END OF SEPTEMBER.

            START DATE 7/79          END DATE   9/79
                         ON NOVEMBER THIRD THE UNIT WILL GO DOWN FOR A 4-6 WEEK SCHEDULED OUTAGE.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	ARIZONA ELECTRIC POWER COOP	
PLANT NAME	APACHE	
UNIT NUMBER	3	
CITY	COCHISE	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	344.	(.800 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	590.0	
GROSS UNIT GENERATING CAPACITY - MW	195.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	175.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	183.0	
EQUIVALENT SCRUBBED CAPACITY - MW	195.0	
** BOILER DATA		
SUPPLIER	RILEY STOKER	
TYPE	PULVERIZED COAL	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	**/**	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	122.	(400 FT)
STACK TOP DIAMETER - M	4.9	(16.2 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10000-11000
AVERAGE ASH CONTENT - %	15.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.55	
RANGE SULFUR CONTENT - %	0.5-0.8	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.6	
** FGD SYSTEM		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH COTTRELL	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
COMMERCIAL DATE	4/79	
INITIAL START-UP	6/79	
CONSTRUCTION COMPLETION	4/79	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENT INDEX	.0	
** ABSORBER		
NUMBER	2	
TYPE	PACKED/SPRAY TOWER	
INITIAL START UP	4/79	
SUPPLIER	RESEARCH COTTRELL	
NUMBER OF STAGES	1	
SHELL MATERIAL	CARBON STEEL	
SHELL LINER MATERIAL	GLASS-FLEX	
GAS FLOW - CU.M/S	188.76	(400000 ACFM)
GAS TEMPERATURE - C	132.2	(270 F)
LIQUID RECIRCULATION RATE - LITER/S	1260.	(20000 GPM)

```
ARIZONA ELECTRIC POWER COOP: APACHE 3 (CONT.)

     PRESSURE DROP - KPA                                1.5         ( 6.0 IN-H2O)

 ** MIST ELIMINATOR
     NUMBER                                            4
     TYPE                                             CHEVRON
     CONSTRUCTION MATERIAL                            POLYPROPYLENE
     CONFIGURATION                                    HORIZONTAL
     NUMBER OF STAGES                                     2
     NUMBER OF PASSES                                     3

 ** WATER LOOP
     TYPE                                             OPEN
     FRESH MAKEUP WATER ADDITION - LITERS/S             340.2        ( 5400 GPM)

 ** DISPOSAL
     NATURE                                           FINAL
     TYPE                                             POND
     LOCATION                                         OFF-SITE
     TRANSPORTATION                                   PUMPED
     DIMENSIONS                                       22 ACRES X 18 FT DEEP
     AREA - ACRES                                        22.0
     CAPACITY - CU.M                                      484308      (    396.0 ACRE-FT)

 ** DISPOSAL
     NATURE                                           FINAL
     TYPE                                             POND
     LOCATION                                         OFF-SITE
     TRANSPORTATION                                   PUMPED
     DIMENSIONS                                       64 ACRES X 18 FT DEEP
     AREA - ACRES                                        64.0
     CAPACITY - CU.M                                      1408896     (  1152.0 ACRE-FT)

--------------------------------------PERFORMANCE DATA---------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

 6/79  SYSTEM
                                                                             720

       ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  6/79        END DATE  6/79
                       UNIT #3 COMMENCED OPERATION DURING JUNE.  THE UTILITY REPORTED THAT THE
                       START-UP WAS TYPICAL WITH NUMEROUS MINOR PROBLEMS.

 7/79  SYSTEM
                                                                             744

 8/79  SYSTEM
                                                                             744

 9/79  SYSTEM
                                                                             720

       ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  7/79        END DATE  9/79
                       DURING THE THIRD QUARTER THE UNIT ONLY OPERATED ABOUT 25% OF THE TIME
                       BECAUSE OF CONTINUING PROBLEMS WITH THE REAGENT FEED LINE.  THE SECTION
                       FROM THE GRINDER TO THE SCRUBBERS WAS FRP AND IT FAILED.  THE LINE WAS
                       REPAIRED AT THE END OF SEPTEMBER.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOLLA	
UNIT NUMBER	1	
CITY	JOSEPH CITY	
STATE	ARIZONA	
GROSS UNIT GENERATING CAPACITY - MW	119.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	115.0	
EQUIVALENT SCRUBBED CAPACITY - MW	119.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
AVERAGE ASH CONTENT - %	13.50	
AVERAGE MOISTURE CONTENT - %	15.00	
AVERAGE SULFUR CONTENT - %	.50	
AVERAGE CHLORIDE CONTENT - %	.02	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH COTTRELL	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	3.4	
INITIAL START-UP DATE	10/73	
COMMERCIAL START-UP DATE	12/73	
SO2 DESIGN REMOVAL EFFICIENCY - %	92.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	80.00	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	7.6	(120 GPM)
** DISPOSAL		
TYPE	POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	A		88.2	88.1	88.2						
	B		85.6	88.3	85.6						
	SYSTEM		86.9	88.2	86.9			744	744	647	
1/79	A		99.2	99.1	99.2						
	B		100.0	100.0	100.0						
	SYSTEM		99.6	99.6	99.6			744	744	741	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 12/78 END DATE 1/79
THE UTILITY HAS REPORTED THAT THE FGD SYSTEM EXPERIENCED CONTROL PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	A		100.0	100.0	100.0						
	B		100.0	100.0	100.0						
	SYSTEM		100.0	100.0	100.0			672	672	672	
3/79	A		95.3	95.0	95.3						
	B		100.0	100.0	100.0						
	SYSTEM		97.7	97.5	97.7			744	744	727	

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL  PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  3/79        END DATE  3/79
                        THE UTILITY HAS EXPERIENCED PLUGGED REHEAT TUBES.  THE OLD TUBES, IN UN-
                        SECTIONALIZED BUNDLES, WERE REPLACED WITH NEW TUBES OF SPLIT COIL CON-
                        STRUCTION AND MADE OF 316L SS.  THE NEW TYPE OF TUBES ALONG WITH BETTER
                        MAINTENANCE PROCEDURES HAS ADDED TO THE REHEAT TUBE LIFE AND AVAILABILI-
                        TY.

 4/79  A                          100.0       100.0       100.0
       B                          100.0       100.0       100.0
       SYSTEM                     100.0       100.0       100.0                    720   720    720

 5/79  A                           99.1        99.4        99.1
       B                           44.1        44.1        44.1
       SYSTEM                      71.6        71.8        71.6                    744   744    533

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  5/79
                        CORRODED DUCTWORK ON MODULE B WAS REPLACED DURING MAY.

 6/79  A                           78.0        78.0        78.0
       B                          100.0       100.0       100.0
       SYSTEM                      89.0        89.0        89.0                    720   720    642

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  6/79        END DATE  6/79
                        THE MUNTERS PACKING WAS REPLACED AND MAINTENANCE WAS PERFORMED ON THE
                        MODULE A DISCHARGE HEADER.

 7/79  SYSTEM                                                                      744

 8/79  SYSTEM                                                                      744

 9/79  SYSTEM                                                                      720

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  9/79
                        NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THIS PERIOD.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOLLA	
UNIT NUMBER	2	
CITY	JOSEPH CITY	
STATE	ARIZONA	
GROSS UNIT GENERATING CAPACITY - MW	350.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	250.0	
EQUIVALENT SCRUBBED CAPACITY - MW	350.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
AVERAGE ASH CONTENT - %	13.50	
AVERAGE MOISTURE CONTENT - %	15.00	
AVERAGE SULFUR CONTENT - %	.50	
AVERAGE CHLORIDE CONTENT - %	.02	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH COTTRELL	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	4/78	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	75.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.70	
ABSORBER SPARE CAPACITY INDEX - %	33.0	
ABSORBER SPARE COMPONENTS INDEX	1.0	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	7.6	(120 GPM)
** DISPOSAL		
TYPE	POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 12/78 END DATE 6/79
OPERATION PARAMATERS ARE STILL UNAVAILABLE FOR THIS UNIT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  9/79
                        NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THIS PERIOD.
```

```
                                        SECTION 3
                     DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------------

 COMPANY NAME                                        CENTRAL ILLINOIS LIGHT
 PLANT NAME                                          DUCK CREEK
 UNIT NUMBER                                         1
 CITY                                                CANTON
 STATE                                               ILLINOIS
 GROSS UNIT GENERATING CAPACITY - MW                   416.0
 NET UNIT GENERATING CAPACITY W/FGD - MW               378.0
 EQUIVALENT SCRUBBED CAPACITY - MW                     378.0

 ** FUEL DATA
    FUEL TYPE                                        COAL
    FUEL GRADE                                       BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                        24423.        ( 10500 BTU/LB)
    AVERAGE ASH CONTENT - %                              9.12
    AVERAGE MOISTURE CONTENT - %                        18.00
    AVERAGE SULFUR CONTENT - %                           3.30
    AVERAGE CHLORIDE CONTENT - %                          .03

 ** FGD SYSTEM
    GENERAL PROCESS TYPE                             WET SCRUBBING
    PROCESS TYPE                                     LIMESTONE
    SYSTEM SUPPLIER                                  RILEY STOKER/ENVIRONEERING
    NEW/RETROFIT                                     NEW
    ENERGY CONSUMPTION - %                              2.9
    INITIAL START-UP DATE                            9/76
    COMMERCIAL START-UP DATE                         8/78
    SO2 DESIGN REMOVAL EFFICIENCY - %                  85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.80
    ABSORBER SPARE COMPONENTS INDEX                     1.0

 ** WATER LOOP
    TYPE                                             CLOSED
    FRESH MAKE-UP WATER - LITER/S                      37.8         (  600 GPM)

 ** DISPOSAL
    TYPE                                             LINED POND


---------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

12/78  A           23.0        25.0        25.0        23.0
       B           26.0        28.0        28.0        26.0
       C           21.0        23.0        23.0        21.0
       D           10.0        11.0        11.0        10.0
       SYSTEM      20.0        21.0        21.0        20.0                     744   706    151  66.0

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE 12/78        END DATE 12/78
                      ISOLATION DAMPER FAILURES AND SLURRY RECYCLE DISCHARGE VALVE FAILURES
                      OCCURRED DURING DECEMBER.

            START DATE 12/78        END DATE 12/78
                      LIMESTONE MILL PROBLEMS AND A PLUGGED LIMESTONE FEEDER HAMPERED SCRUBBER
                      OPERATIONS DURING DECEMBER.

            START DATE 12/78        END DATE 12/78
                      FROZEN INSTRUMENT CONTROL LINES WERE A PROBLEM.

 1/79  A             .0          .0          .0          .0
       B             .0          .0          .0          .0
       C             .0          .0          .0          .0
       D             .0          .0          .0          .0
       SYSTEM        .0          .0          .0          .0                     744   738      0
```

```
CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)


-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  1/79          END DATE  1/79
                          FROZEN INSTRUMENT CONTROL LINES, RECYCLE TANK SUCTION LINES, MAIN MODULE
                          DRAIN LINES AND MIST ELIMINATOR DRAIN LINES WERE MAJOR PROBLEM AREAS
                          DURING JANUARY.

              START DATE  1/79          END DATE  1/79
                          SLURRY RECYCLE VALVE PLUGGAGE AND SLURRY TRANSFER PUMP FAILURE CONTRIBUTED
                          TO THE SYSTEM OUTAGE TIME.

2/79   A               .0          .0          .0          .0
       B               .0          .0          .0          .0
       C               .0          .0          .0          .0
       D               .0          .0          .0          .0
       SYSTEM          .0          .0          .0          .0                  672   533      0  80.5

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  2/79          END DATE  2/79
                          RECYCLE PUMP SUCTION VALVE FAILURES AND A SLURRY TRANSFER PUMP FAILURE
                          CONTRIBUTED TO THE NON-OPERATION OF THE FGD SYSTEM.

              START DATE  2/79          END DATE  2/79
                          FROZEN MIST ELIMINATOR DRAINS, ABSORBER DRAINS AND INSTRUMENT LINES WERE
                          A MAJOR PROBLEM DURING FEBRUARY.

3/79   A             33.7        31.1        31.1        31.1
       B              6.7         6.7         6.7         6.7
       C               .0          .0          .0          .0
       D               .0          .0          .0          .0
       SYSTEM        10.1         9.4         9.4         9.4                  744   744     70

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  3/79          END DATE  3/79
                          FREEZING PROBLEMS CONTINUED TO HAMPER FGD OPERATIONS DURING MARCH.

              START DATE  3/79          END DATE  3/79
                          BROKEN MIST ELIMINATOR SPRAY LINES AND PLUGGED MIST ELIMINATOR NOZZLES
                          WERE PROBLEM AREAS DURING MARCH.

              START DATE  3/79          END DATE  3/79
                          RECYCLE PUMP FAILURES AND WASTE WATER PUMP FAILURES WERE EXPERIENCED
                          DURING MARCH.

              START DATE  3/79          END DATE  3/79
                          PLUGGED SLURRY NOZZLES AND GENERAL INSTRUMENTATION PROBLEMS WERE REPORTED
                          BY THE UTILITY.

4/79   A            100.0        71.9                    67.3
       B             84.3        50.5                    47.3
       C             86.5        81.2                    76.0
       D             21.3        22.7                    21.3
       SYSTEM        73.0        56.4        72.0        53.0                  720   674     80

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  4/79          END DATE  4/79
                          INLET DAMPER MALFUNCTIONS HINDERED FGD OPERATION DURING APRIL.

              START DATE  4/79          END DATE  4/79
                          PLUGGED MIST ELIMINATOR SPRAY NOZZLES DURING APRIL HINDERED FGD OPERATION.

              START DATE  4/79          END DATE  4/79
                          SLURRY CONTROL VALVE MALFUNCTIONS WERE REPORTED BY THE UTILITY.

              START DATE  4/79          END DATE  4/79
                          RECYCLE TANK MIXER FAILURES WERE EXPERIENCED DURING APRIL.
```

```
EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)


-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

             START DATE  4/79          END DATE  5/79
                         RECYCLE PUMP BELT AND BEARING FAILURES AND SLURRY SUPPLY LINE FAILURES
                         WERE REPORTED BY THE UTILITY.

5/79   A           95.7        37.4                     1.3
       B           95.7        44.2                    11.7
       C           94.6        41.8                    11.1
       D            1.3         5.0                     1.3
       SYSTEM      71.9        32.1          51.4       8.5                  744   197    63

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/79          END DATE  5/79
                         MIST ELIMINATOR PUMP MALFUNCTIONS WERE REPORTED DURING MAY.

             START DATE  5/79          END DATE  5/79
                         MILL SHAKER BASKET DRIVE MOTOR FAILURES WERE ENCOUNTERED.

6/79   A           70.6        76.9                    70.5
       B           79.9        86.9                    79.9
       C           76.1        83.1                    76.3
       D           82.6        90.0                    82.6
       SYSTEM      87.4        84.2          86.1      77.3                  720   661   557

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  6/79          END DATE  6/79
                         DURING JUNE SOME PROBLEMS WITH THE MIST ELIMINATOR WERE ENCOUNTERED.  THESE
                         PROBLEMS INCLUDED PLUGGING IN THE MIST ELIMINATOR AND THE MIST ELIMINATOR
                         LINES AND A BROKEN MIST ELIMINATOR RETURN LINE.

7/79   A                       85.6                    59.8
       B           61.6        88.3                    61.6
       C           61.6        87.9                    61.4
       D           60.3        86.5                    60.5
       SYSTEM      95.0        87.1          95.9      60.9                  744   520   453

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  7/79          END DATE  7/79
                         IN JULY THE MIST ELIMINATOR PLUGGED CAUSING OPERATIONAL PROBLEMS.

             START DATE  7/79          END DATE  7/79
                         RECYCLE PUMP FAILURES WERE ENCOUNTERED DURING JULY.

8/79   A            3.0         4.2                     3.1
       B           23.4        31.4                    23.4
       C           13.6        18.4                    13.7
       D            9.5        12.8                     9.5
       SYSTEM      13.0        16.6          22.9      12.3                  744   555    92

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  8/79          END DATE  8/79
                         IN AUGUST THE MIST ELIMINATOR AND THE MIST ELIMINATOR DRAIN LINES PLUGGED
                         CAUSING SOME DOWN TIME.

             START DATE  8/79          END DATE  8/79
                         FAILURES WITH THE LIMESTONE SLURRY FORWARDING PUMP AND THE RECYCLE PUMP
                         WERE ENCOUNTERED.

             START DATE  8/79          END DATE  8/79
                         DAMPER MALFUNCTIONS WERE REPORTED BY THE UTILITY.

9/79   A           49.9        54.0                    49.9
       B           44.6        48.4                    44.7
       C           35.9        38.9                    35.9
       D           79.6        86.2                    79.6
       SYSTEM      65.7        56.8          64.8      52.5                  720   665   378
```

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

```
-----------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER   FGD   CAP.
                                                                SO2  PART.  HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- -----  ----- ------  ----- ------

      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  9/79        END DATE  9/79
                        PLUGGING IN THE MIST ELIMINATOR, MIST ELIMINATOR HEADER AND NOZZLES
                        WERE ENCOUNTERED IN SEPTEMBER.

            START DATE  9/79        END DATE  9/79
                        THE DAMPER FAILED CAUSING A PROBLEM DURING SEPTEMBER.

            START DATE  9/79        END DATE  9/79
                        THE UTILITY REPORTED MIST ELIMINATOR CAVITATION PROBLEMS.

            START DATE  9/79        END DATE  9/79
                        PLUGGED SLURRY NOZZLES AND LIMESTONE CONVEYOR FAILURES CONTRIBUTED TO THE
                        OUTAGES EXPERIENCED.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
------------------------------------------------------------------------------------------------------------
COMPANY NAME                                  CENTRAL ILLINOIS PUBLIC SERV
PLANT NAME                                    NEWTON
UNIT NUMBER                                   1
CITY                                          NEWTON
STATE                                         ILLINOIS
REGULATORY CLASSIFICATION                     A
PARTICULATE EMISSION LIMITATION - NG/J        ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW            *******
GROSS UNIT GENERATING CAPACITY - MW             617.0
NET UNIT GENERATING CAPACITY W/FGD - MW         575.0
NET UNIT GENERATING CAPACITY WO/FGD - MW      *******
EQUIVALENT SCRUBBED CAPACITY - MW               617.0

** BOILER DATA
     SUPPLIER                                 COMBUSTION ENGINEERING
     TYPE                                     PULVERIZED COAL
     SERVICE LOAD                             BASE
     COMMERCIAL SERVICE DATE                   0/78
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S     1020.95        (2163480 ACFM)
     FLUE GAS TEMPERATURE - C                   163.9         ( 327 F)
     STACK HEIGHT - M                           162.          ( 530 FT)
     STACK TOP DIAMETER - M                   *******         (***** FT)

** FUEL DATA
     FUEL TYPE                                COAL
     FUEL GRADE                               BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                25353.         ( 10900 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                               ******
     AVERAGE ASH CONTENT - %                       4.00
     RANGE ASH CONTENT - %                    ******
     AVERAGE MOISTURE CONTENT - %             ********
     RANGE MOISTURE CONTENT - %               ******
     AVERAGE SULFUR CONTENT - %                    4.00
     RANGE SULFUR CONTENT - %                 ******
     AVERAGE CHLORIDE CONTENT - %                   .20
     RANGE CHLORIDE CONTENT - %               ******

** ESP
     NUMBER                                   1
     TYPE                                     COLD SIDE
     SUPPLIER                                 RESEARCH COTTRELL
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %   99.5
     FLUE GAS TEMPERATURE - C                  162.8          (  325 F)

** FGD SYSTEM
     SALEABLE PRODUCT/THROWAWAY PRODUCT       THROWAWAY PRODUCT
     GENERAL PROCESS TYPE                     WET SCRUBBING
     PROCESS TYPE                             DUAL ALKALI
     SYSTEM SUPPLIER                          BUELL/ENVIROTECH
     A-E FIRM                                 SARGENT & LUNDY
     DEVELOPMENT LEVEL                        FULL SCALE
     NEW/RETROFIT                             NEW
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %   99.50
     SO2 DESIGN REMOVAL EFFICIENCY - %           95.00
     COMMERCIAL DATE                          12/79
     INITIAL START-UP                          9/79
     CONSTRUCTION INITIATION                  11/76

** ABSORBER
     NUMBER                                   4
     TYPE                                     TRAY TOWER
     INITIAL START UP                         11/79
     SUPPLIER                                 BUELL ENVIROTECH
     SHELL LINER MATERIAL                     CEILCOTE
     L/G RATIO - L/CU.M                          1.3          ( 10.0 GAL/1000ACF)
     SUPERFICAL GAS VELOCITY - M/SEC             2.5          (  8.3 FT/S)
     SO2 INLET CONCENTRATION - PPM            2590
     SO2 OUTLET CONTRATION - PPM               200
```

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

** FANS		
NUMBER	4	
TYPE	BOOSTER	
** VACUUM FILTER		
TYPE	EXTRACTION FILTERS,HORIZONTAL,BELT T	
** MIST ELIMINATOR		
NUMBER	8	
CONFIGURATION	VERTICAL	
** REHEATER		
NUMBER	1	
TYPE	BYPASS	
** REHEATER		
NUMBER	2	
TYPE	IN-LINE	
TEMPERATURE BOOST - C	13.9	(25 F)
** THICKENER		
NUMBER	2	
CONSTRUCTION MATERIAL	CONCRETE	
DIAMETER - M	30.5	(100 FT)
** THICKENER		
NUMBER	1	
CONSTRUCTION MATERIAL	COATED STEEL	
DIAMETER - M	15.2	(50 FT)
** WATER LOOP		
TYPE	CLOSED	
** TREATMENT		
TYPE	POZ-O-TEC	
CONTRACTOR	IUCS	

--PERFORMANCE DATA--

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 9/79 END DATE 9/79

INITIAL OPERATIONS BEGAN AT THIS UNIT ON SEPTEMBER 1 WHEN FLUE GAS WAS PASSED THROUGH THE INDIVIDUAL FGD MODULES FOR TESTING PURPOSES. TESTING OF THE SYSTEM IN AN INTEGRATED MODE IS EXPECTED TO BEGIN IN DECEMBER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	COLUMBUS & SOUTHERN OHIO ELEC.	
PLANT NAME	CONESVILLE	
UNIT NUMBER	5	
CITY	CONESVILLE	
STATE	OHIO	
GROSS UNIT GENERATING CAPACITY - MW	411.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	375.0	
EQUIVALENT SCRUBBED CAPACITY - MW	411.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25237.	(10850 BTU/LB)
AVERAGE ASH CONTENT - %	15.10	
AVERAGE MOISTURE CONTENT - %	7.50	
AVERAGE SULFUR CONTENT - %	4.67	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	3.9	
INITIAL START-UP DATE	1/77	
COMMERCIAL START-UP DATE	2/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	89.50	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.60	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	31.5	(500 GPM)
** TREATMENT		
TYPE	POZ-O-TEC	
** DISPOSAL		
TYPE	LANDFILL	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	A	.0	.0	.0	.0						
	B	.0	.0	.0	.0						
	SYSTEM	.0	.0	.0	.0			672		0	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 2/79
THE SYSTEM DID NOT OPERATE DURING FEBRUARY BECAUSE OF SEVERE WINTER WEATHER

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	A	50.0	49.0	50.0	43.0						
	B	.0	.0	.0	.0						
	SYSTEM	25.0	24.5	25.0	21.5			744	652	160	
4/79	A	17.0	58.0	73.0	12.0						
	B	.0	.0	.0	.0						
	SYSTEM	8.5	29.0	36.5	6.0			720	149	43	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 4/79
MODULE B DID NOT OPERATE DURING APRIL BECAUSE OF SEVERE CORROSION AT THE PRESATURATOR INLET DUCT WHICH UOP HAS BEEN REPAIRING SINCE MARCH.

```
COLUMBUS & SOUTHERN OHIO ELEC.: CONESVILLE 5 (CONT.)


-----------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 5/79  A          .0          .0          .0          .0
       B          .0          .0          .0          .0
       SYSTEM     .0          .0          .0          .0                     744   744      0

     ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  5/79        END DATE  5/79
                      REPAIRS WERE MADE TO THE SEAL BETWEEN THE THICKENER BASE AND SIDEWALL.

          START DATE  5/79        END DATE  5/79
                      THE FGD SYSTEM WAS DOWN DURING MAY FOR AN ANNUAL OUTAGE.

 6/79  A        69.0        35.0        36.0        33.0
       B        50.0        21.0        22.0        20.0
       SYSTEM   59.5        28.0        29.0        26.5                     720   670    191

     ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  5/79        END DATE  6/79
                      PLUGGED PH LINES WERE A PROBLEM DURING MAY AND JUNE.

          START DATE  5/79        END DATE  6/79
                      FLYASH CONVEYING PROBLEMS RESULTED IN ABOUT 2 DAYS OUTAGE.

          START DATE  6/79        END DATE  6/79
                      OUTLET DAMPER PROBLEMS WERE REPORTED BY THE UTILITY.

 7/79  SYSTEM                                                                744

 8/79  SYSTEM                                                                744

 9/79  SYSTEM                                                                720

     ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  7/79        END DATE  9/79
                      NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THE THIRD QUARTER.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
--------------------------------------------------------------------------------------------------------

 COMPANY NAME                                   COLUMBUS & SOUTHERN OHIO ELEC.
 PLANT NAME                                     CONESVILLE
 UNIT NUMBER                                    6
 CITY                                           CONESVILLE
 STATE                                          OHIO
 GROSS UNIT GENERATING CAPACITY - MW              411.0
 NET UNIT GENERATING CAPACITY W/FGD - MW          375.0
 EQUIVALENT SCRUBBED CAPACITY - MW                411.0

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                  25237.        ( 10850 BTU/LB)
     AVERAGE ASH CONTENT - %                         15.10
     AVERAGE MOISTURE CONTENT - %                     7.50
     AVERAGE SULFUR CONTENT - %                       4.67
     AVERAGE CHLORIDE CONTENT - %               ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                       WET SCRUBBING
     PROCESS TYPE                               LIME
     SYSTEM SUPPLIER                            AIR CORRECTION DIVISION, UOP
     NEW/RETROFIT                               NEW
     ENERGY CONSUMPTION - %                          3.9
     INITIAL START-UP DATE                       6/78
     COMMERCIAL START-UP DATE                   **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %              89.50
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.60
     ABSORBER SPARE CAPACITY INDEX - %                .0
     ABSORBER SPARE COMPONENTS INDEX                  .0

 ** WATER LOOP
     TYPE                                       OPEN
     FRESH MAKE-UP WATER - LITER/S                31.5         (  500 GPM)

 ** TREATMENT
     TYPE                                       POZ-O-TEC

 ** DISPOSAL
     TYPE                                       LANDFILL


-------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ---- ----- ----- ------ ----- ------

 2/79  A              .0          .0          .0          .0
       B              .0          .0          .0          .0
       SYSTEM         .0          .0          .0          .0                 672                0

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  2/79        END DATE  2/79
                          THE FGD SYSTEM DID NOT OPERATE DURING FEBRUARY DUE TO SEVERE WINTER WEATHER

 3/79  A            43.0        37.0        39.0        33.0
       B            32.0        28.0        29.0        25.0
       SYSTEM       37.5        32.5        34.0        29.0                 744   664    216

 4/79  A            82.0        79.0        79.0        78.0
       B            72.0        59.0        59.0        58.0
       SYSTEM       77.0        69.0        69.0        68.0                 720   711    489

 5/79  A              .0          .0          .0          .0
       B              .0          .0          .0          .0
       SYSTEM         .0          .0          .0          .0                 744     0      0
```

COLUMBUS & SOUTHERN OHIO ELEC.: CONESVILLE 6 (CONT.)

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

        ** PROBLEMS/SOLUTIONS/COMMENTS

                START DATE  5/79        END DATE  5/79
                            REPAIRS WERE MADE TO THE SEAL BETWEEN THE THICKENER BASE AND SIDEWALL.

                START DATE  5/79        END DATE  5/79
                            THE BOILER DID NOT OPERATE DURING MAY.

 6/79  A            43.0        37.0        39.0        27.0
       B            49.0        49.0        52.0        31.0
       SYSTEM       46.0        43.0        45.5        29.0                   720   433    186

        ** PROBLEMS/SOLUTIONS/COMMENTS

                START DATE  6/79        END DATE  6/79
                            FLYASH CONVEYING PROBLEMS RESULTED IN ABOUT 2 DAYS OUTAGE.

                START DATE  5/79        END DATE  6/79
                            PLUGGED PH LINES WERE A PROBLEM DURING THIS PERIOD.

 7/79  SYSTEM                                                                  744

 8/79  SYSTEM                                                                  744

 9/79  SYSTEM                                                                  720

        ** PROBLEMS/SOLUTIONS/COMMENTS

                START DATE  7/79        END DATE  9/79
                            NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THE THIRD QUARTER.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	COOPERATIVE POWER ASSOCIATION	
PLANT NAME	COAL CREEK	
UNIT NUMBER	1	
CITY	UNDERWOOD	
STATE	NORTH DAKOTA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1100.0	
GROSS UNIT GENERATING CAPACITY - MW	545.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	495.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*******	
EQUIVALENT SCRUBBED CAPACITY - MW	327.0	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED LIGNITE	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	**/**	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	198.	(650 FT)
STACK TOP DIAMETER - M	6.7	(22.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	14556.	(6258 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		3068-7660
AVERAGE ASH CONTENT - %	7.14	
RANGE ASH CONTENT - %	3.89-15.95	
AVERAGE MOISTURE CONTENT - %	39.83	
RANGE MOISTURE CONTENT - %	27.78-52.55	
AVERAGE SULFUR CONTENT - %	.63	
RANGE SULFUR CONTENT - %	0.18-1.41	
AVERAGE CHLORIDE CONTENT - %	.02	
RANGE CHLORIDE CONTENT - %	0.00-0.08	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	WHEELABRATOR-FRYE	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.5	
FLUE GAS TEMPERATURE - C	160.6	(321 F)
PARTICULATE OUTLET LOAD - G/CU.M	.02	(.01 GR/SCF)
** FGD SYSTEM		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
INITIAL START-UP	8/79	
CONSTRUCTION INITIATION	8/77	
** ABSORBER		
NUMBER	4	
TYPE	SPRAY TOWER	
INITIAL START UP	8/79	
SUPPLIER	COMBUSTION ENGINEERING	
NUMPER OF STAGES	3	
DIMENSIONS - FT	22 X 22 X 20	
SHELL MATERIAL	316L SS	
NOZZLE TYPE	PROPRIETARY ATOMIZING	
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000ACF)
SO2 INLET CONCENTRATION - PPM	1000	
SO2 OUTLET CONTRATION - PPM	100	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.0	

```
COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

 ** FANS
     NUMBER                                      4
     TYPE                                        I.D.

 ** MIST ELIMINATOR
     NUMBER                                      1
     TYPE                                        CHEVRON
     CONSTRUCTION MATERIAL                       FRP
     NUMBER OF STAGES                              2

 ** MIST ELIMINATOR
     NUMBER                                      1
     TYPE                                        BULK ENTRAINMENT SEPARATOR
     CONSTRUCTION MATERIAL                       FRP

 ** PUMPS
     SERVICE                                     NUMBER
     -------                                     ------
     BLEED STREAM                                  3
     SLURRY FEED                                  ****
     REACTION TANK                                 6

 ** TANKS
     SERVICE                                     NUMBER
     -------                                     ------
     REACTION-RECYCLE-THICKENER                    2
     FLYASH WETTING                               ****
     LIME FEED                                    ****

 ** REHEATER
     TYPE                                        BYPASS
     TEMPERATURE BOOST - C                         47.2        (   85 F)

 ** WATER LOOP
     TYPE                                        OPEN

 ** REAGENT PREPARATION EQUIPMENT
     NUMBER OF SLAKERS                             1

 ** TREATMENT
     TYPE                                        FLYASH STABILIZED

 ** DISPOSAL
     NATURE                                      FINAL
     TYPE                                        LINED POND
     AREA - ACRES                                 104.0


-----------------------------------------PERFORMANCE DATA---------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 8/79  SYSTEM                                                               744

 9/79  SYSTEM                                                               720

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  8/79       END DATE  9/79
                        THIS UNIT STARTED COMMERCIAL OPERATIONS ON AUGUST 1, 1979.  SOME MINOR
                        PROBLEMS WERE REPORTED DURING START UP.
```

```
                                          SECTION 3
                    DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------

  COMPANY NAME                                    DUQUESNE LIGHT
  PLANT NAME                                      ELRAMA
  UNIT NUMBER                                     1-4
  CITY                                            ELRAMA
  STATE                                           PENNSYLVANIA
  GROSS UNIT GENERATING CAPACITY - MW               510.0
  NET UNIT GENERATING CAPACITY W/FGD - MW           475.0
  EQUIVALENT SCRUBBED CAPACITY - MW                 510.0

  ** FUEL DATA
     FUEL TYPE                                    ******
     FUEL GRADE                                   ******
     AVERAGE HEAT CONTENT - J/G                   *******        (****** BTU/LB)
     AVERAGE ASH CONTENT - %                      ********
     AVERAGE MOISTURE CONTENT - %                 ********
     AVERAGE SULFUR CONTENT - %                   ********
     AVERAGE CHLORIDE CONTENT - %                 ********

  ** FGD SYSTEM
     GENERAL PROCESS TYPE                         WET SCRUBBING
     PROCESS TYPE                                 LIME
     SYSTEM SUPPLIER                              CHEMICO
     NEW/RETROFIT                                 RETROFIT
     ENERGY CONSUMPTION - %                           3.5
     INITIAL START-UP DATE                        10/75
     COMMERCIAL START-UP DATE                     10/75
     SO2 DESIGN REMOVAL EFFICIENCY - %               83.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.00
     ABSORBER SPARE CAPACITY INDEX - %               35.0
     ABSORBER SPARE COMPONENTS INDEX                  1.3

  ** WATER LOOP
     TYPE                                         OPEN
     FRESH MAKE-UP WATER - LITER/S                *******        (***** GPM)

  ** TREATMENT
     TYPE                                         POZ-O-TEC

  ** DISPOSAL
     TYPE                                         LANDFILL


-------------------------------------------PERFORMANCE DATA----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 7/78  101                    63.8                    59.9
       201                   100.0                   100.0
       301                    70.8                    66.5
       401                   100.0                    99.3
       501                    82.1                    77.2
       SYSTEM                 85.7                    80.5                     744   699   599

 8/78  101                    84.4                    76.9
       201                   100.0                   100.0
       301                    55.6                    50.7
       401                   100.0                   100.0
       501                    77.9                    70.9
       SYSTEM                 87.5                    79.7                     744   678   593

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE   8/78        END DATE   9/78
                         DURING AUGUST, MODULES 301 AND 501 WERE TAKEN OFF LINE FOR CLEANING.

            START DATE   8/78        END DATE   9/78
                         RUBBER LINING ON THREE FAN HOUSINGS WAS REPAIRED.
```

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERFORMANCE DATA

START DATE 8/78 END DATE 9/78
IT WAS NECESSARY TO SHUT DOWN THE LIME MIXING BASIN IN ORDER TO CLEAN OUT EXCESSIVE GRIT AND SOLIDS BUILD UP.

START DATE 12/78 END DATE 12/78
A COMPLIANCE TEST WAS RUN IN DECEMBER WHICH SHOWED THE UNITS TO BE IN COMPLIANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/78	101		78.2		72.1						
	201		61.0		56.3						
	301		96.5		89.0						
	401		84.6		78.1						
	501		100.0		93.6						
	SYSTEM		84.3		77.8			720	664	560	
10/78	101		84.9		76.6						
	201		100.0		98.9						
	301		100.0		100.0						
	401		89.3		80.5						
	501		87.2		78.6						
	SYSTEM		96.4		86.9			744	671	647	
11/78	101		100.0		100.0						
	201		94.2		78.4						
	301		100.0		84.2						
	401		100.0		86.8						
	501		75.0		62.5						
	SYSTEM		98.8		82.4			720	600	593	
12/78	101		100.0		94.7						
	201		77.8		72.7						
	301		91.7		85.6						
	401		69.4		64.8						
	501		74.4		69.5						
	SYSTEM		82.8		77.4			744	695	576	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 12/78 END DATE 1/79
THE UTILITY HAS STARTED HAULING SLUDGE OFF SITE TO AN AREA ABOUT 10 MILES AWAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/79	101		45.9		39.8						
	201		100.0		95.2						
	301		22.9		60.2						
	401		100.0		100.0						
	501		100.0		100.0						
	SYSTEM		91.2		79.0			744	645	588	
2/79	101		100.0		100.0						
	201		96.3		90.2						
	301		15.1		14.1						
	401		100.0		97.3						
	501		100.0		100.0						
	SYSTEM		85.8		80.4			672	629	540	
3/79	101		100.0		95.4						
	201		100.0		91.0						
	301		97.5		73.8						
	401		51.9		39.2						
	501		87.0		65.9						
	SYSTEM		96.6		73.1			744	563	544	
4/79	101		81.1		61.9						
	201		70.0		53.5						
	301		100.0		99.3						
	401		100.0		89.9						
	501		100.0		90.4						
	SYSTEM		100.0		76.5			720	550	569	

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERFORMANCE DATA											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	101		100.0		100.0						
	201		100.0		97.8						
	301		94.5		83.1						
	401		100.0		100.0						
	501		24.3		21.4						
	SYSTEM		91.5		80.5			744	655	599	
6/79	101		100.0		100.0						
	201		63.1		58.5						
	301		43.2		40.0						
	401		100.0		100.0						
	501		100.0		100.0						
	SYSTEM		86.1		79.7			720	667	574	
7/79	101		89.1		81.0						
	201		100.0		94.8						
	301		94.5		86.0						
	401		100.0		99.3						
	501		44.8		40.7						
	SYSTEM		88.3		80.4			744	677	598	
8/79	101		100.0		98.7						
	201		100.0		100.0						
	301		100.0		96.5						
	401		36.7		33.3						
	501		80.3		72.8						
	SYSTEM		88.4		80.2			744	675	597	

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	DUQUESNE LIGHT
PLANT NAME	PHILLIPS
UNIT NUMBER	1-6
CITY	SOUTH HEIGHT
STATE	PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW	408.0
NET UNIT GENERATING CAPACITY W/FGD - MW	373.0
EQUIVALENT SCRUBBED CAPACITY - MW	410.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26830. (11535 BTU/LB)
AVERAGE ASH CONTENT - %	16.27
AVERAGE MOISTURE CONTENT - %	5.02
AVERAGE SULFUR CONTENT - %	1.92
AVERAGE CHLORIDE CONTENT - %	********
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	CHEMICO
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	3.4
INITIAL START-UP DATE	7/73
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	83.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	18.0
ABSORBER SPARE COMPONENTS INDEX	.6
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	******* (***** GPM)
** TREATMENT	
TYPE	POZ-O-TEC
** DISPOSAL	
TYPE	LANDFILL

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/78	101		82.8		48.3						
	201		75.3		43.9						
	301		100.0		78.7						
	401		100.0		76.0						
	SYSTEM		100.0		61.7			744	434	459	
8/78	101		100.0		97.3						
	201		88.1		71.9						
	301		100.0		88.8						
	401		100.0		65.1						
	SYSTEM		100.0		85.8			744	607	638	
9/78	101		91.6		62.4						
	201		100.0		75.5						
	301		99.2		67.5						
	401		81.8		55.7						
	SYSTEM		95.9		65.3			720	490	470	

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 8/78 END DATE 9/78
DURING THE AUGUST-SEPTEMBER PERIOD MIST ELIMINATOR CLEANING TOOK PLACE IN ORDER TO CORRECT THE PLUGGING PROBLEM.

START DATE 8/78 END DATE 9/78
IN AUGUST THE INTERNAL MIST ELIMINATOR ON MODULE 201 WAS REPLACED.

START DATE 8/78 END DATE 9/78
THE LIME MIXING BASIN HAD TO BE SHUT DOWN OVER A WEEKEND SO THAT EXCESSIVE GRIT AND SOLID PARTICLES THAT HAD BUILT UP COULD BE CLEANED OUT.

START DATE 8/78 END DATE 9/78
HIGH PRESSURE WATER CLEANING WAS PERFORMED ON MODULES 101 AND 401.

START DATE 8/78 END DATE 9/78
THE RUBBER LINING IN MODULE 101 WAS REPAIRED.

START DATE 8/78 END DATE 9/78
A MAJOR PROBLEM AREA DURING THE PERIOD WAS CAUSED BY INSUFFICIENT SUPPLIES OF DRY FLYASH TO MIX WITH THE SLUDGE. AS A RESULT THE SLUDGE HAS BEEN LEAKING OUT OF THE TRANSPORT TRUCKS WHILE IN TRANSIT TO THE FINAL DISPOSAL SITE. APPARENTLY NOT ENOUGH FLYASH IS BEING COLLECTED WITH THE PRESENT SYSTEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/78	101		100.0		96.1						
	201		100.0		87.5						
	301		100.0		87.9						
	401		3.3		2.2						
	SYSTEM		98.5		68.4			744	517	509	
11/78	101		51.5		41.1						
	201		100.0		100.0						
	301		100.0		88.9						
	401		86.4		69.0						
	SYSTEM		93.6		74.7			720	575	538	
12/78	101		100.0		90.9						
	201		100.0		68.0						
	301		38.5		27.8						
	401		100.0		87.5						
	SYSTEM		100.0		73.5			744	537	547	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 12/78 END DATE 1/79
DURING THE PERIOD THE LACK OF FLYASH FOR MIXING WITH SLUDGE WAS A PROBLEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/79	101		100.0		86.7						
	201		95.5		69.2						
	301		69.0		50.0						
	401		100.0		83.7						
	SYSTEM		100.0		72.4			744	539	539	
2/79	101		50.3		38.8						
	201		93.4		72.1						
	301		100.0		88.2						
	401		100.0		100.0						
	SYSTEM		96.9		74.8			672	519	503	
3/79	101		.0		.0						
	201		100.0		96.2						
	301		100.0		88.0						
	401		100.0		100.0						
	SYSTEM		96.2		71.1			744	550	529	
4/79	101		100.0		86.8						

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERFORMANCE DATA											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	201		9.3		5.8						
	301		100.0		85.0						
	401		100.0		84.9						
	SYSTEM		100.0		65.7			720	453	473	
5/79	101		100.0		100.0						
	201		.0		.0						
	301		100.0		96.6						
	401		100.0		99.1						
	SYSTEM		100.0		73.9			744	543	550	
6/79	101		100.0		70.6						
	201		34.2		22.2						
	301		100.0		83.8						
	401		100.0		77.2						
	SYSTEM		97.6		63.4			720	468	457	
7/79	101		100.0		98.7						
	201		100.0		95.8						
	301		89.8		71.4						
	401		32.1		25.5						
	SYSTEM		91.7		72.8			744	591	542	
8/79	101		100.0		100.0						
	201		100.0		89.5						
	301		100.0		89.2						
	401		.0		.0						
	SYSTEM							744	561		

```
---------------------------------------------------------------------------------------------------

COMPANY NAME                                  INDIANAPOLIS POWER & LIGHT
PLANT NAME                                    PETERSBURG
UNIT NUMBER                                   3
CITY                                          PETERSBURG
STATE                                         INDIANA
GROSS UNIT GENERATING CAPACITY - MW             532.0
NET UNIT GENERATING CAPACITY W/FGD - MW         515.0
EQUIVALENT SCRUBBED CAPACITY - MW               532.0

** FUEL DATA
   FUEL TYPE                                  COAL
   FUEL GRADE                                 BITUMINOUS
   AVERAGE HEAT CONTENT - J/G                  25004.         ( 10750 BTU/LB)
   AVERAGE ASH CONTENT - %                    ********
   AVERAGE MOISTURE CONTENT - %               ********
   AVERAGE SULFUR CONTENT - %                     3.25
   AVERAGE CHLORIDE CONTENT - %               ********

** FGD SYSTEM
   GENERAL PROCESS TYPE                       WET SCRUBBING
   PROCESS TYPE                               LIMESTONE
   SYSTEM SUPPLIER                            AIR CORRECTION DIVISION, UOP
   NEW/RETROFIT                               NEW
   ENERGY CONSUMPTION - %                        2.4
   INITIAL START-UP DATE                      12/77
   COMMERCIAL START-UP DATE                   **/**
   SO2 DESIGN REMOVAL EFFICIENCY - %            85.00
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %    99.30
   ABSORBER SPARE COMPONENTS INDEX                .6

** WATER LOOP
   TYPE                                       CLOSED
   FRESH MAKE-UP WATER - LITER/S                55.6        (  882 GPM)

** TREATMENT
   TYPE                                       POZ-O-TEC

** DISPOSAL
   TYPE                                       POND


-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2 PART. HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                               672

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  2/79
                        THE UTILIZATION FIGURES GIVEN BELOW ARE FOR THE PERIOD SEPTEMBER-DECEMBER
                        1978.

 3/79  A                                                 31.2
       B                                                 30.0
       C                                                 48.0
       D                                                 48.0
       SYSTEM                                            39.0                   744          715

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  1/79        END DATE  3/79
                        THE FGD SYSTEM WAS DOWN FROM JANUARY 1 TO MARCH 15 DUE TO SEVERE WINTER
                        WEATHER.

 4/79  SYSTEM                                                               722
```

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

```
-------------------------------------------PERFORMANCE DATA--------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

        ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79        END DATE  5/79
                        DUE TO THE FORMER STACK LINING PEELING AWAY, THE STEEL
                        SHELL WAS SAND BLASTED AND RIGIFLAKE 4050 APPLIED BY TROWEL.

            START DATE  4/79        END DATE  5/79
                        ALL MIST ELIMINATORS WERE CLEANED DUE TO SEVERE SCALING PROBLEMS.

            START DATE  4/79        END DATE  5/79
                        EXTENSIVE REPAIRS WERE MADE TO THE INLET DAMPERS, THE OUTLET DUCTS WERE
                        LINED WITH RESISTIFLAKE 1150, AND MAJOR REPAIRS WERE MADE TO BONNETS
                        BECAUSE OF ACID CORROSION.

            START DATE  4/79        END DATE  5/79
                        THE SYSTEM HAS BEEN DOWN SINCE MID-MARCH FOR INSPECTION AND MAINTENANCE.

 5/79   SYSTEM
                                                                           744
 6/79   SYSTEM
                                                                           720
        ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  6/79
                        THE UTILITY REPORTED THAT THE SYSTEM RAN ABOUT THREE DAYS TOTAL DURING THIS
                        PERIOD.

            START DATE  5/79        END DATE  6/79
                        PROCESS CONTROL HAS BEEN A VERY MAJOR PROBLEM AREA.

            START DATE  5/79        END DATE  6/79
                        MIST ELIMINATOR PLUGGING CONTRIBUTED TO THE OUTAGE EXPERIENCED DURING THIS
                        PERIOD.

 7/79   SYSTEM
                                                                           744
 8/79   SYSTEM
                                                                           744
 9/79   SYSTEM
                                                                           720
        ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  9/79
                        NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THE THIRD QUARTER 1979.
```

```
----------------------------------------------------------------------------------------------------

 COMPANY NAME                                      KANSAS CITY POWER & LIGHT
 PLANT NAME                                        HAWTHORN
 UNIT NUMBER                                       3
 CITY                                              KANSAS CITY
 STATE                                             MISSOURI
 GROSS UNIT GENERATING CAPACITY - MW                  90.0
 NET UNIT GENERATING CAPACITY W/FGD - MW              85.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    90.0

 ** FUEL DATA
    FUEL TYPE                                      COAL
    FUEL GRADE                                     BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                      22795.        ( 9800 BTU/LB)
    AVERAGE ASH CONTENT - %                           11.00
    AVERAGE MOISTURE CONTENT - %                   ********
    AVERAGE SULFUR CONTENT - %                          .60
    AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
    GENERAL PROCESS TYPE                           WET SCRUBBING
    PROCESS TYPE                                   LIME
    SYSTEM SUPPLIER                                COMBUSTION ENGINEERING
    NEW/RETROFIT                                   RETROFIT
    ENERGY CONSUMPTION - %                             2.2
    INITIAL START-UP DATE                          11/72
    COMMERCIAL START-UP DATE                       **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                 70.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.00
    ABSORBER SPARE COMPONENTS INDEX                     .6

 ** WATER LOOP
    TYPE                                           CLOSED
    FRESH MAKE-UP WATER - LITER/S                  *******        (***** GPM)

 ** TREATMENT
    TYPE                                           FLYASH STABILIZED

 ** DISPOSAL
    TYPE                                           POND

------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL    PER  BOILER  FGD   CAP.
                                                               SO2   PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

2/79   SYSTEM                                                               672

3/79   SYSTEM                                                               744

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  1/79        END DATE  3/79
                          OPERATING INFORMATION IS STILL NOT AVAILABLE FOR UNIT 3.

4/79   SYSTEM     18.0        100.0                  18.1                   720   130    130   9.0

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  4/79        END DATE  4/79
                          THE BOILER WAS DOWN IN APRIL FOR 543 HOURS FOR TURBINE OVERHAUL.

5/79   SYSTEM     55.0        100.0                  55.0                   744   409    409  29.0

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  5/79        END DATE  5/79
                          IN MAY THE OUTAGE TIME WAS DUE TO BOILER TUBE LEAKS.

6/79   SYSTEM     96.0                                                      720   691
```

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
7/79	SYSTEM	100.0						744	744		
8/79	SYSTEM	75.0						744	558		
9/79	SYSTEM	84.0						720	605		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 6/79 END DATE 8/79

THE UTILITY BURNED PRIMARILY GAS DURING JUNE, JULY AND AUGUST. THE UNIT RETURNED TO FIRING ALL COAL IN SEPTEMBER. THE SCRUBBER WAS LARGELY AVAILABLE BUT WAS NOT NEEDED FOR MOST OF THE PERIOD. THE UTILITY REPORTED ONLY REGULAR MAINTENANCE TOOK PLACE WITH NO PROBLEMS ENCOUNTERED.

```
                                            SECTION 3
                    DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------------

 COMPANY NAME                                    KANSAS CITY POWER & LIGHT
 PLANT NAME                                      HAWTHORN
 UNIT NUMBER                                     4
 CITY                                            KANSAS CITY
 STATE                                           MISSOURI
 GROSS UNIT GENERATING CAPACITY - MW                90.0
 NET UNIT GENERATING CAPACITY W/FGD - MW            85.0
 EQUIVALENT SCRUBBED CAPACITY - MW                  90.0

 ** FUEL DATA
     FUEL TYPE                                   COAL
     FUEL GRADE                                  BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                   22795.         ( 9800 BTU/LB)
     AVERAGE ASH CONTENT - %                         11.00
     AVERAGE MOISTURE CONTENT - %                ********
     AVERAGE SULFUR CONTENT - %                        .60
     AVERAGE CHLORIDE CONTENT - %                ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                        WET SCRUBBING
     PROCESS TYPE                                LIME
     SYSTEM SUPPLIER                             COMBUSTION ENGINEERING
     NEW/RETROFIT                                RETROFIT
     ENERGY CONSUMPTION - %                          2.2
     INITIAL START-UP DATE                        8/72
     COMMERCIAL START-UP DATE                    **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %              70.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.00
     ABSORBER SPARE COMPONENTS INDEX                   .6

 ** WATER LOOP
     TYPE                                        CLOSED
     FRESH MAKE-UP WATER - LITER/S               *******         (***** GPM)

 ** TREATMENT
     TYPE                                        FLYASH STABILIZED

 ** DISPOSAL
     TYPE                                        POND


-----------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL  PER BOILER  FGD   CAP.
                                                                 SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                 672

 3/79  SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  1/79        END DATE  3/79
                         OPERATING INFORMATION FOR UNIT 4 IS STILL NOT AVAILABLE.

 4/79  SYSTEM      57.0        100.0                    57.0                  720   410    410  30.0

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  4/79        END DATE  4/79
                         AN EXCITER FAILURE ON THE GENERATOR CAUSED THE APRIL OUTAGE TIME.

 5/79  SYSTEM      94.0        100.0                    94.0                  744   699    699  49.0

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/79        END DATE  5/79
                         MAY OUTAGE TIME WAS FOR SCRUBBER CLEANING AND GENERAL MAINTENANCE.

 6/79  SYSTEM      14.0                                                       720   101
```

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM	93.0						744	692		
8/79	SYSTEM	100.0						744	744		
9/79	SYSTEM	69.0						720	497		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 6/79 END DATE 9/79

DURING JULY AND AUGUST MOSTLY GAS WAS FIRED. THERE WERE NO MAJOR SCRUBBER PROBLEMS AND HIGH AVAILABILITY RESULTED BECAUSE OF THE LOW DEMAND FOR THE UNIT.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT
PLANT NAME	LA CYGNE
UNIT NUMBER	1
CITY	LA CYGNE
STATE	KANSAS
GROSS UNIT GENERATING CAPACITY - MW	874.0
NET UNIT GENERATING CAPACITY W/FGD - MW	820.0
EQUIVALENT SCRUBBED CAPACITY - MW	874.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	21913. (9421 BTU/LB)
AVERAGE ASH CONTENT - %	24.36
AVERAGE MOISTURE CONTENT - %	8.60
AVERAGE SULFUR CONTENT - %	5.39
AVERAGE CHLORIDE CONTENT - %	.03
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	2.7
INITIAL START-UP DATE	2/73
COMMERCIAL START-UP DATE	6/73
SO2 DESIGN REMOVAL EFFICIENCY - %	80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE COMPONENTS INDEX	.6
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	72.3 (1148 GPM)
** DISPOSAL	
TYPE	UNLINED POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	A	95.0									
	B	94.6									
	C	92.6									
	D	93.5									
	E	95.1									
	F	94.3									
	G	94.1									
	H	93.8									
	SYSTEM	94.1						672	342		
3/79	A	96.1									
	B	96.0									
	C	93.2									
	D	95.6									
	E	96.5									
	F	94.8									
	G	95.7									
	H	93.4									
	SYSTEM	95.2						744	314		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79

NO MAJOR FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR FEBRUARY OR MARCH.

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

```
------------------------------------PERFORMANCE DATA------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

           START DATE  2/79         END DATE  3/79
                       THE UTILITY HAS REPORTED THAT MANY TUBE LEAKS AND CYCLONE LEAKS WERE
                       EXPERIENCED WITH THE BOILER.

 4/79  A          95.5
       B          95.7
       C          94.4
       D          91.4
       E          95.5
       F          96.2
       G          95.9
       H          95.7
       SYSTEM     95.0                                                           720   638

 5/79  A          96.5
       B          96.3
       C          96.7
       D          95.3
       E          95.4
       F          95.7
       G          96.3
       H          95.5
       SYSTEM     96.0                                                           744   476

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  5/79         END DATE  5/79
                       THE UTILITY REPORTED THAT NO MAJOR FGD PROBLEMS HAD OCCURRED.

 6/79  SYSTEM                                                                    720     0

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  5/79         END DATE  6/79
                       THE UNIT WAS REMOVED FROM SERVICE THE LATTER PART OF MAY FOR SCHEDULED
                       BOILER OVERHAUL AND REMAINED OUT OF SERVICE THROUGH JUNE.

 7/79  SYSTEM                                                                    744     0      0

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  7/79         END DATE  7/79
                       THE TURBINE WAS OVERHAULED DURING JULY.  DURING THE OUTAGE SOME MINOR
                       MAINTENANCE WAS PERFORMED ON THE SCRUBBING SYSTEM.

 8/79  A          86.8
       B          95.9
       C          96.3
       D          96.3
       E          95.9
       F          96.2
       G          88.5
       H          96.9
       SYSTEM     94.1                                                           744   231

 9/79  A          96.0
       B          96.1
       C          95.6
       D          94.3
       E          96.7
       F          96.1
       G          96.0
       H          96.9
       SYSTEM     96.0                                                           720
```

```
EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)


------------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  8/79        END DATE  9/79
                        THE FGD UNITS OPERATED WITH NO MAJOR PROBLEMS AND ONLY REGULAR MAINTENANCE
                        WAS PERFORMED DURING AUGUST AND SEPTEMBER.
```

```
                                  SECTION 3
                 DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------

COMPANY NAME
PLANT NAME                                       KANSAS POWER & LIGHT
UNIT NUMBER                                      JEFFREY
CITY                                             1
STATE                                            WAMEGO
GROSS UNIT GENERATING CAPACITY - MW              KANSAS
NET UNIT GENERATING CAPACITY W/FGD - MW            720.0
EQUIVALENT SCRUBBED CAPACITY - MW                  680.0
                                                   540.0
** FUEL DATA
   FUEL TYPE
   FUEL GRADE                                    COAL
   AVERAGE HEAT CONTENT - J/G                    ******
   AVERAGE ASH CONTENT - %                        18899.        ( 8125 BTU/LB)
   AVERAGE MOISTURE CONTENT - %                       5.80
   AVERAGE SULFUR CONTENT - %                        28.00
   AVERAGE CHLORIDE CONTENT - %                        .32
                                                       .01
** FGD SYSTEM
   GENERAL PROCESS TYPE
   PROCESS TYPE                                  WET SCRUBBING
   SYSTEM SUPPLIER                               LIMESTONE
   NEW/RETROFIT                                  COMBUSTION ENGINEERING
   ENERGY CONSUMPTION - %                        NEW
   INITIAL START-UP DATE                         *******
   COMMERCIAL START-UP DATE                       8/78
   SO2 DESIGN REMOVAL EFFICIENCY - %             **/**
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %       80.00
   ABSORBER SPARE CAPACITY INDEX - %               99.00
   ABSORBER SPARE COMPONENTS INDEX                 20.0
                                                    1.0
** WATER LOOP
   TYPE
   FRESH MAKE-UP WATER - LITER/S                 CLOSED
                                                   35.1         ( 557 GPM)
** TREATMENT
   TYPE
                                                 NONPROPRIETARY
** DISPOSAL
   TYPE
                                                 POND


-------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 2/79  SYSTEM
                                                                            672
 3/79  SYSTEM
                                                                            744
 4/79  SYSTEM
                                                                            720     0      0     .0
 5/79  SYSTEM
                                                                            744     0      0     .0
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79          END DATE  5/79
                        THE BOILER WAS SHUT DOWN FOR WARRANTY INSPECTION ON APRIL 1 AND REMAINED
                        OUT OF SERVICE DURING MAY.
 6/79  SYSTEM
                                                                            720
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  6/79          END DATE  6/79
                        THE UTILITY REPORTED THAT THE UNIT RETURNED TO  SERVICE THE FIRST WEEK OF
                        JUNE AND HAS SUFFERED NO OPERATIONAL DIFFICULTIES SINCE RESTART.
 7/79  SYSTEM
                                                                            744
```

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79

OPERATIONS WERE NOT UNUSUAL THROUGH JULY AND AUGUST. THE UNIT PASSED THE COMPLIANCE TEST DURING THE JUNE-JULY PERIOD. THE UNIT WILL SHUT DOWN IN MID-SEPTEMBER FOR THE NORMAL 2 WEEK INSPECTION AND MAINTENANCE OUTAGE. THE UNIT IS EXPECTED BACK ON LINE ON OCTOBER 1.

```
                                  SECTION 3
              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------------------

COMPANY NAME                                      KANSAS POWER & LIGHT
PLANT NAME                                        LAWRENCE
UNIT NUMBER                                       4
CITY                                              LAWRENCE
STATE                                             KANSAS
GROSS UNIT GENERATING CAPACITY - MW                 125.0
NET UNIT GENERATING CAPACITY W/FGD - MW             115.0
EQUIVALENT SCRUBBED CAPACITY - MW                   125.0

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    ******
    AVERAGE HEAT CONTENT - J/G                     23260.        ( 10000 BTU/LB)
    AVERAGE ASH CONTENT - %                           9.80
    AVERAGE MOISTURE CONTENT - %                     12.00
    AVERAGE SULFUR CONTENT - %                         .55
    AVERAGE CHLORIDE CONTENT - %                       .03

** FGD SYSTEM
    GENERAL PROCESS TYPE                          WET SCRUBBING
    PROCESS TYPE                                  LIMESTONE
    SYSTEM SUPPLIER                               COMBUSTION ENGINEERING
    NEW/RETROFIT                                  RETROFIT
    ENERGY CONSUMPTION - %                        *******
    INITIAL START-UP DATE                          1/76
    COMMERCIAL START-UP DATE                      **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                73.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        98.90
    ABSORBER SPARE CAPACITY INDEX - %                  .0
    ABSORBER SPARE COMPONENTS INDEX                    .0

** WATER LOOP
    TYPE                                          CLOSED
    FRESH MAKE-UP WATER - LITER/S                 *******        (***** GPM)

** TREATMENT
    TYPE                                          FORCED OXIDATION

** DISPOSAL
    TYPE                                          POND


------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 3/79  SYSTEM
                                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  3/79
                        UNIT 4 EXPERIENCED A MOTOR FAILURE ON AN I.D. FAN DURING THE FEBRUARY-
                        MARCH PERIOD.

 4/79  SYSTEM
                                                                              720

 5/79  SYSTEM
                                                                              744

 6/79  SYSTEM
                                                                              720

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  6/79
                        THE UTILITY REPORTED THAT THE SYSTEM RAN WELL.  THE ONLY FGD SYSTEM RELATED
                        OUTAGES WERE DUE TOA  MIXER FAILURE AND GENERAL MAINTENANCE.

 7/79  SYSTEM
                                                                              744

 8/79  SYSTEM
                                                                              744
```

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79
DURING THE THIRD QUARTER AN OUTAGE WAS CAUSED BY MIXER MOTOR AND OTHER MIXER RELATED PROBLEMS. DURING THE OUTAGE MAINTENANCE WAS DONE ON THE BOILER AND SCRUBBERS AND REPAIR WORK WAS DONE ON THE MIXERS.

START DATE 7/79 END DATE 9/79
THE UNIT WAS OPERATED AT HALF LOAD DURING THE LAST WEEK OF SEPTEMBER AND WAS SHUT DOWN COMPLETELY IN EARLY OCTOBER FOR THE ANNUAL FALL OUTAGE.

```
                                                EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

                                                SECTION 3
                          DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------------

   COMPANY NAME
   PLANT NAME                                      KANSAS POWER & LIGHT
   UNIT NUMBER                                     LAWRENCE
   CITY                                            5
   STATE                                           LAWRENCE
   GROSS UNIT GENERATING CAPACITY - MW             KANSAS
   NET UNIT GENERATING CAPACITY W/FGD - MW           420.0
   EQUIVALENT SCRUBBED CAPACITY - MW                 400.0
                                                     420.0
   ** FUEL DATA
      FUEL TYPE
      FUEL GRADE                                   COAL
      AVERAGE HEAT CONTENT - J/G                   ******
      AVERAGE ASH CONTENT - %                       23260.        ( 10000 BTU/LB)
      AVERAGE MOISTURE CONTENT - %                      9.80
      AVERAGE SULFUR CONTENT - %                       12.00
      AVERAGE CHLORIDE CONTENT - %                       .55
                                                         .03
   ** FGD SYSTEM
      GENERAL PROCESS TYPE
      PROCESS TYPE                                 WET SCRUBBING
      SYSTEM SUPPLIER                              LIMESTONE
      NEW/RETROFIT                                 COMBUSTION ENGINEERING
      ENERGY CONSUMPTION - %                       RETROFIT
      INITIAL START-UP DATE                        *******
      COMMERCIAL START-UP DATE                     11/71
      SO2 DESIGN REMOVAL EFFICIENCY - %            **/**
      PARTICULATE DESIGN REMOVAL EFFICIENCY - %      52.00
      ABSORBER SPARE CAPACITY INDEX - %              98.90
      ABSORBER SPARE COMPONENTS INDEX                  .0
                                                       .0
   ** WATER LOOP
      TYPE
      FRESH MAKE-UP WATER - LITER/S                CLOSED
                                                   *******        (***** GPM)
   ** TREATMENT
      TYPE
                                                   FORCED OXIDATION
   ** DISPOSAL
      TYPE
                                                   POND

----------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 2/79  SYSTEM
                                                                            672
 3/79  SYSTEM
                                                                            744
 4/79  SYSTEM
                                                                            720
 5/79  SYSTEM
                                                                            744
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  5/79
                        THE UNIT WAS BROUGHT DOWN TO 1/2 CAPACITY FOR A SCHEDULED 3 WEEK
                        OUTAGE TO REBUILD AN AIR PREHEATER FAN MOTOR.
 6/79  SYSTEM
                                                                            720
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  6/79
                        THE UTILITY REPORTED THAT THE SYSTEM RAN WELL.  THE ONLY FGD SYSTEM RELATED
                        OUTAGES WERE DUE TO MIXER FAILURE AND GENERAL MAINTENANCE.
 7/79  SYSTEM
                                                                            744
```

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79

THE UNIT OPERATED NORMALLY THROUGHOUT THE THIRD QUARTER. THE UNIT WILL COME DOWN FOR THE ANNUAL FALL OUTAGE ON THE 15TH OF OCTOBER. DURING THE OUTAGE SOME BOILER WORK WILL BE DONE. THE SCRUBBER WILL BE CLEANED AND MAINTENANCE WORK WILL BE PERFORMED ON THE MIXERS. THE OUTAGE IS TO LAST TWO WEEKS.

```
                                   SECTION 3
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-------------------------------------------------------------------------------------------

 COMPANY NAME
 PLANT NAME                                          KENTUCKY UTILITIES
 UNIT NUMBER                                         GREEN RIVER
 CITY                                                1-3
 STATE                                               CENTRAL CITY
 GROSS UNIT GENERATING CAPACITY - MW                 KENTUCKY
 NET UNIT GENERATING CAPACITY W/FGD - MW                64.0
 EQUIVALENT SCRUBBED CAPACITY - MW                      60.0
                                                        64.0
 ** FUEL DATA
      FUEL TYPE
      FUEL GRADE                                     COAL
      AVERAGE HEAT CONTENT - J/G                     BITUMINOUS
      AVERAGE ASH CONTENT - %                         25586.        ( 11000 BTU/LB)
      AVERAGE MOISTURE CONTENT - %                      13.40
      AVERAGE SULFUR CONTENT - %                        12.10
      AVERAGE CHLORIDE CONTENT - %                       4.00
                                                     ********
 ** FGD SYSTEM
      GENERAL PROCESS TYPE
      PROCESS TYPE                                   WET SCRUBBING
      SYSTEM SUPPLIER                                LIME
      NEW/RETROFIT                                   AMERICAN AIR FILTER
      ENERGY CONSUMPTION - %                         RETROFIT
      INITIAL START-UP DATE                             3.1
      COMMERCIAL START-UP DATE                       9/75
      SO2 DESIGN REMOVAL EFFICIENCY - %              6/76
      PARTICULATE DESIGN REMOVAL EFFICIENCY - %        80.00
      ABSORBER SPARE CAPACITY INDEX - %                99.50
      ABSORBER SPARE COMPONENTS INDEX                    .0
                                                         .0
 ** WATER LOOP
      TYPE
      FRESH MAKE-UP WATER - LITER/S                  CLOSED
                                                        4.7         (   75 GPM)
 ** DISPOSAL
      TYPE
                                                     LINED POND

---------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 2/79  SYSTEM       .0
                                        .0          .0                       672     0      0     .0
        ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  1/79        END DATE  2/79
                         THE PROBLEMS IN JANUARY AND FEBRUARY WERE A RESULT OF FREEZING WEATHLP.
 3/79  SYSTEM      11.2        100.0       100.0        11.2
                                                                             744    83     83
        ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  3/79        END DATE  4/79
                         THE LOW OPERATIONAL HOURS FOR MARCH AND APRIL WERE DUE TO RECYCLE PUPP
                         PROBLEMS.
 4/79  SYSTEM      18.2        100.0       100.0        18.2
                                                                             720   131    131
 5/79  SYSTEM
                                                         .0                  744     0      0     .0
        ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/79        END DATE  5/79
                         THE BOILER WAS TAKEN DOWN IN MAY FOR REPAIRS THAT ARE PROJECTED TO LAST
                         THROUGH THE END OF SEPTEMPER.
 6/79  SYSTEM     100.0
                                                         .0                  720     0      0     .0
```

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 6/79 END DATE 6/79
THE UNIT REMAINED OUT OF SERVICE DURING JUNE FOR BOILER REPAIRS. IT IS NOT EXPECTED TO RETURN TO SERVICE UNTIL OCTOBER OR NOVEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM	100.0			.0			744	0	0	
8/79	SYSTEM	100.0			.0			744	0	0	
9/79	SYSTEM	100.0			.0			720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79
THE BOILER REMAINED OUT OF SERVICE DURING JULY, AUGUST AND SEPTEMBER. THE BOILER TEMPERATURE VALVES AND PIPING BETWEEN THE PRIMARY AND SECONDARY SUPERHEATERS MUST STILL BE REPLACED. THE BOILER IS NOT EXPECTED TO RETURN ON LINE UNTIL THE FIRST OF THE YEAR OR POSSIBLY AS LATE AS MARCH.

START DATE 7/79 END DATE 9/79
THE NEW INDIRECT REHEAT SYSTEM IS IN PLACE AND READY FOR OPERATION AS SOON AS THE BOILER RETURNS TO SERVICE.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	4	
CITY	LOUISVILLE	
STATE	KENTUCKY	
GROSS UNIT GENERATING CAPACITY - MW	188.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	175.0	
EQUIVALENT SCRUBBED CAPACITY - MW	188.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
AVERAGE ASH CONTENT - %	17.10	
AVERAGE MOISTURE CONTENT - %	9.00	
AVERAGE SULFUR CONTENT - %	3.75	
AVERAGE CHLORIDE CONTENT - %	.04	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	AMERICAN AIR FILTER	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	1.6	
INITIAL START-UP DATE	8/76	
COMMERCIAL START-UP DATE	9/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	6.3	(100 GPM)
** DISPOSAL		
TYPE	LINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	100.0			.0			672	0	0	.0
3/79	SYSTEM	100.0			.0			744	0	0	.0
4/79	SYSTEM	100.0			.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
THE UNIT DID NOT OPERATE DURING THESE MONTHS BECAUSE THE BOILER WAS STILL DOWN WITH TUBE LEAKS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM	100.0			.0			7906	0	0	.0
6/79	SYSTEM		46.2		17.1			720	266	123	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 6/79
THE UNIT REMAINED DOWN DURING MAY FOR CONTINUED REPAIRS AT THE BOILER. THE UNIT WAS PLACED BACK IN SERVICE IN JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM		99.0		93.0			744	701	692	
8/79	SYSTEM		89.0		89.0			744	744	664	

EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
9/79	SYSTEM		.0		.0			720	168	0	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79

THE ONLY MAJOR PROBLEMS OCCURRED DURING SEPTEMBER. TUBE FAILURES WERE ENCOUNTERED CAUSING THE BOILER OUTAGE AND MECHANICAL FAILURE WITH THE DAMPER GATES CAUSED THE SCRUBBED DOWNTIME.

```
                                       SECTION 3
                     DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
--------------------------------------------------------------------------------------------------

 COMPANY NAME                                  LOUISVILLE GAS & ELECTRIC
 PLANT NAME                                    CANE RUN
 UNIT NUMBER                                   5
 CITY                                          LOUISVILLE
 STATE                                         KENTUCKY
 GROSS UNIT GENERATING CAPACITY - MW             190.0
 NET UNIT GENERATING CAPACITY W/FGD - MW         180.0
 EQUIVALENT SCRUBBED CAPACITY - MW               190.0

 ** FUEL DATA
     FUEL TYPE                                 COAL
     FUEL GRADE                                BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                 26749.         ( 11500 BTU/LB)
     AVERAGE ASH CONTENT - %                      17.10
     AVERAGE MOISTURE CONTENT - %                  9.00
     AVERAGE SULFUR CONTENT - %                    3.75
     AVERAGE CHLORIDE CONTENT - %                   .04

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                      WET SCRUBBING
     PROCESS TYPE                              LIME
     SYSTEM SUPPLIER                           COMBUSTION ENGINEERING
     NEW/RETROFIT                              RETROFIT
     ENERGY CONSUMPTION - %                        1.6
     INITIAL START-UP DATE                     12/77
     COMMERCIAL START-UP DATE                   5/79
     SO2 DESIGN REMOVAL EFFICIENCY - %            85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %    99.00
     ABSORBER SPARE CAPACITY INDEX - %              .0
     ABSORBER SPARE COMPONENTS INDEX                .0

 ** WATER LOOP
     TYPE                                      OPEN
     FRESH MAKE-UP WATER - LITER/S             *******         (***** GPM)

 ** TREATMENT
     TYPE                                      POZ-O-TEC

 ** DISPOSAL
     TYPE                                      LINED POND


----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM               70.6                    50.1                   672   477    337

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  2/79        END DATE  2/79
                       DURING FEBRUARY FREEZING CAUSED PROBLEMS WITH LIME DELIVERY.

 3/79  SYSTEM               71.8                    57.5                   744   596    428

 4/79  SYSTEM               99.2                    49.6                   720   360    357

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  2/79        END DATE  4/79
                       SOME PROBLEMS WERE EXPERIENCED WITH DAMPERS AND THERE WERE PUMP FAILURES.

 5/79  SYSTEM               84.3                    49.1                   744   433    365

 6/79  SYSTEM               77.0                    58.2                   720   544    419
```

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 6/79

THE ONLY PROBLEMS REPORTED BY THE UTILITY WERE SPRAY PUMP PACKING FAILURES AND WELDING FAILURES ON THE REHEATER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM		72.0		56.0			744	583	420	
8/79	SYSTEM		88.0		73.0			744	613	540	
9/79	SYSTEM		84.0		54.0			720	469	392	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79

THE WELDING PROBLEMS WITH THE REHEATER WERE ENCOUNTERED IN JULY AND SEPTEMBER. THE FAILURES ARE CONTINUING AND ARE EXPECTED TO BE RESOLVED BY THIS WINTER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	6	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	50.	(.116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	992.0	
GROSS UNIT GENERATING CAPACITY - MW	288.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	269.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	272.0	
EQUIVALENT SCRUBBED CAPACITY - MW	288.0	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	3/69	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	502.57	(1065000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	158.	(518 FT)
STACK TOP DIAMETER - M	4.9	(16.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10,400-11,900
AVERAGE ASH CONTENT - %	17.10	
RANGE ASH CONTENT - %	15.5-24.5	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	8.0-10.75	
AVERAGE SULFUR CONTENT - %	4.80	
RANGE SULFUR CONTENT - %	3.5-6.3	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	0.03-0.06	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.4	
FLUE GAS CAPACITY - CU.M/S	502.6	(1065000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
** FGD SYSTEM		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI	
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
SO2 DESIGN REMOVAL EFFICIENCY - %	95.00	
INITIAL START-UP	4/79	
CONTRACT AWARDED	10/76	
ABSORBER SPARE CAPACITY INDEX - %	20.0	
ABSORBER SPARE COMPONENT INDEX	.3	
** ABSORBER		
NUMBER	2	
TYPE	TRAY TOWER	
INITIAL START UP	12/78	
SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
NUMBER OF STAGES	2	
DIMENSIONS - FT	32 DIA X 45	
SHELL MATERIAL	A283 CARBON STEEL	
SHELL LINER MATERIAL	FLAKE REINFORCED POLYESTER	
INTERNAL MATERIAL	317L SS, 316 SS, FRP PIPING	
BOILER LOAD/ABSORBER - %	60.0	
GAS FLOW - CU.M/S	251.29	(532500 ACFM)
GAS TEMPERATURE - C	80.0	(176 F)

```
EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

     L/G RATIO - L/CU.M                             1.3        ( 10.0 GAL/1000ACF)
     PRESSURE DROP - KPA                            2.2        ( 9.0 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/SEC                2.7        (  9.0 FT/S)
     SO2 INLET CONCENTRATION - PPM               3471
     SO2 OUTLET CONTRATION - PPM                  200
     SO2 DESIGN REMOVAL EFFICIENCY - %              95.0

 ** CENTRIFUGL
     NUMBER                                      0

 ** FANS
     NUMBER                                      2
     TYPE                                       BOOSTER, CENTRIFUGAL
     CONSTRUCTION MATERIALS                     A441 CARBON STEEL
     SERVICE - WET/DRY                          DRY
     CAPACITY - CU.M/S                            251.52        ( 533000 ACFM)

 ** VACUUM FILTER
     NUMBER                                      3
     TYPE                                       ROTARY-DRUM WITH WATER WASH
     CONSTRUCTION MATERIAL                      316 SS [FILTER DRUM], FRP[BELT CLOTH]
     CAPACITY - M T/D                             684.8        (  755 T/D)
     INLET SOLIDS - %                              25.0
     OUTLET SOLIDS - %                             63.0

 ** MIST ELIMINATOR
     NUMBER                                      1
     TYPE                                       CHEVRON
     CONSTRUCTION MATERIAL                      POLYPROPYLENE
     CONFIGURATION                              HORIZONTAL
     NUMBER OF PASSES                              4
     FREEBOARD DISTANCE - M                        1.52       ( 5.0 FT)
     PRESSURE DROP - KPA                            .2        ( 1.0 IN-H2O)

 ** PUMPS
     SERVICE                                    NUMBER
     -------                                    ------
     REACTOR PUMP                                  2
     RECYCLE                                       4
     THICKENER HOLD TANK PUMP                      2
     LIME SLURRY                                   2
     SODA ASH PUMP                                 2
     THICKENER UNDERFLOW                           2
     VACUUM                                        3

 ** TANKS
     SERVICE                                    NUMBER
     -------                                    ------
     PRIMARY REACTION TANK                         2
     SECONDARY REACTION TANK                       2
     FEED FORWARD TANK                          ****
     FILTRATE SUMP                              ****
     THICKENER HOLD TANK                           1

 ** REHEATER
     NUMBER                                      2
     TYPE                                       DIRECT COMBUSTION
     TEMPERATURE BOOST - C                         27.8        (   50 F)
     ENERGY REQUIRED                            25632000 BTU/HR FOR FLUE GAS PLUS 1282000 BTU/HR

 ** THICKENER
     NUMBER                                      1
     TYPE                                       FLAT BOTTOM
     CONSTRUCTION MATERIAL                      CONCRETE SHELL, CARBON STEEL INTERIOR, FLAKE NEI
     DIAMETER - M                                  38.1        (125 FT)
     OUTLET SOLIDS - %                             25.0

 ** WATER LOOP
     TYPE                                       CLOSED
     EVAPORATOR WATER LOSS - LITER/S               17.5        (  278 GPM)

 ** TREATMENT
     CONTRACTOR                                 IUCS
     PRODUCT CHARACTERISTICS                    2CASO3-H2O [85%],CASO4 [10-15%], CACO3 [5-10%],N
```

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

```
** DISPOSAL
   NATURE
   TYPE                                     FINAL
   LOCATION                                 LINED POND
                                            ON-SITE

-----------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 4/79  SYSTEM                 43.3                  37.9
                                                                             62   475    237
      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  4/79        END DATE  4/79
                       THIS UNIT STARTED OPERATING ON APRIL 4, 1979.  COMPLIANCE TESTING IS
                       SCHEDULED FOR THE WEEK OF JUNE 3.
 5/79  SYSTEM                 21.5                  14.7
                                                                            744   506    109
 6/79  SYSTEM                 12.3                  10.3
                                                                            720   601     74
      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  6/79        END DATE  6/79
                       THE UTILITY REPORTED THAT THE SYSTEM IS STILL CONSIDERED IN START-UP AND
                       THAT NO UNUSUAL PROCESS PROBLEMS HAVE BEEN ENCOUNTERED.  HOWEVER THE SYS-
                       TEM IS NOW OUT OF SERVICE DUE TO THE COMPLETE FAILURE OF THE MIST ELIM-
                       INATORS.  IT IS EXPECTED TO BE DOWN FOR A MONTH.
 7/79  SYSTEM                   .0                    .0
                                                                            744   529      0
      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  7/79        END DATE  7/79
                       THE UNIT DID NOT OPERATE IN JULY AS PROCEDURES CONTINUED TO REPLACED THE
                       MIST ELIMINATORS.
 8/79  SYSTEM                  7.0                   7.0
                                                                            744   683     51
 9/79  SYSTEM                 60.0                  44.0
                                                                            720   531    317
      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  8/79        END DATE  9/79
                       DURING AUGUST AND SEPTEMBER THE UNIT DOWNTIME WAS DUE TO THE COMPLETE
                       FAILURE OF FIVE PUMPS.  THE PUMP PROBLEMS WERE THE LOSS OF THE IMPELLERS
                       OFF OF THE SHAFTS.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC
PLANT NAME	MILL CREEK
UNIT NUMBER	3
CITY	LOUISVILLE
STATE	KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW	442.0
NET UNIT GENERATING CAPACITY W/FGD - MW	420.0
EQUIVALENT SCRUBBED CAPACITY - MW	442.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26749. (11500 BTU/LB)
AVERAGE ASH CONTENT - %	11.50
AVERAGE MOISTURE CONTENT - %	********
AVERAGE SULFUR CONTENT - %	3.75
AVERAGE CHLORIDE CONTENT - %	********
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	AMERICAN AIR FILTER
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	1.6
INITIAL START-UP DATE	8/78
COMMERCIAL START-UP DATE	3/79
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE COMPONENTS INDEX	.3
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	9.4 (150 GPM)
** TREATMENT	
TYPE	FLYASH/LIME STABILIZED
** DISPOSAL	
TYPE	POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM		18.0		17.4			672	651	117	
3/79	SYSTEM		53.1		52.4			744	735	390	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79

COMPLIANCE TESTING WAS PERFORMED DURING MARCH AND THE UNIT WAS DECLARED COMMERCIAL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM		63.6		44.4			720	503	320	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79

THE ONLY PROBLEMS REPORTED WERE WITH DAMPERS AND PUMP FAILURES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM		97.8		64.7			744	492	481	
6/79	SYSTEM		51.9		47.9			720	665	345	

```
LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)


--------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
        ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  6/79
                        THE UTILITY REPORTED THAT NO UNUSUAL OPERATING PROBLEMS WERE ENCOUNTERED.
7/79   SYSTEM                60.0                    55.0                  744   686    411
8/79   SYSTEM                                                              744   550
9/79   SYSTEM                90.0                    84.0                  720   667    604
        ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  9/79
                        IN JULY AND AUGUST REHEATER PROBLEMS WERE ENCOUNTERED.  THE REHEATER WILL
                        HAVE TO BE REPLACED DURING EITHER NOVEMBER OR DECEMBER OF THIS YEAR.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	PADDY'S RUN	
UNIT NUMBER	6	
CITY	LOUISVILLE	
STATE	KENTUCKY	
GROSS UNIT GENERATING CAPACITY - MW	72.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	67.0	
EQUIVALENT SCRUBBED CAPACITY - MW	72.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
AVERAGE ASH CONTENT - %	11.50	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	2.50	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	2.8	
INITIAL START-UP DATE	4/73	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.10	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	3.1	(50 GPM)
** TREATMENT		
TYPE	LIME STABILIZED	
** DISPOSAL		
TYPE	POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	100.0			.0			672	0	0	.0
3/79	SYSTEM	100.0			.0			744	0	0	.0
4/79	SYSTEM	100.0			.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
THE UNIT WAS NOT OPERATED DURING THESE MONTHS BECAUSE OF LACK OF DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM	100.0			.0			744	0	0	.0
6/79	SYSTEM	100.0			.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 6/79
THE UTILITY REPORTED THAT THE UNIT DID NOT OPERATE DURING MAY OR JUNE DUE TO INSUFFICIENT DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM		.0		.0			744	19	0	

```
                                                EPA UTILITY FGD SURVEY: THIRD QUARTER 1979
LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)


------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
8/79   SYSTEM                  45.4                    13.3                   744   218     99

9/79   SYSTEM                    .0                      .0                   720    36      0

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79         END DATE  9/79
                        NO PROBLEMS WERE REPORTED WITH RESPECT TO OPERATION AT THIS UNIT DURING THE
                        THIRD QUARTER 1979.
```

```
                                            SECTION 3
                      DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------------------

 COMPANY NAME
 PLANT NAME                                        MINNKOTA POWER COOPERATIVE
 UNIT NUMBER                                       MILTON R. YOUNG
 CITY                                              2
 STATE                                             CENTER
 GROSS UNIT GENERATING CAPACITY - MW               NORTH DAKOTA
 NET UNIT GENERATING CAPACITY W/FGD - MW             440.0
 EQUIVALENT SCRUBBED CAPACITY - MW                   402.0
                                                     405.0
 ** FUEL DATA
     FUEL TYPE
     FUEL GRADE                                    COAL
     AVERAGE HEAT CONTENT - J/G                    LIGNITE
     AVERAGE ASH CONTENT - %                        15119.        ( 6500 BTU/LB)
     AVERAGE MOISTURE CONTENT - %                      6.50
     AVERAGE SULFUR CONTENT - %                       38.00
     AVERAGE CHLORIDE CONTENT - %                       .70
                                                   ********
 ** FGD SYSTEM
     GENERAL PROCESS TYPE
     PROCESS TYPE                                  WET SCRUBBING
     SYSTEM SUPPLIER                               LIME/ALKALINE FLYASH
     NEW/RETROFIT                                  ADL/COMBUSTION EQUIP ASSOCIATE
     ENERGY CONSUMPTION - %                        NEW
     INITIAL START-UP DATE                             1.6
     COMMERCIAL START-UP DATE                       9/77
     SO2 DESIGN REMOVAL EFFICIENCY - %              6/78
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %        85.00
     ABSORBER SPARE CAPACITY INDEX - %                99.60
     ABSORBER SPARE COMPONENTS INDEX                    .0
                                                        .0
 ** WATER LOOP
     TYPE
     FRESH MAKE-UP WATER - LITER/S                 OPEN
                                                     44.1         ( 700 GPM)
 ** DISPOSAL
     TYPE
                                                   MINEFILL


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 1/79   A            4.6        5.1
        B           37.7       28.4                      4.6
        SYSTEM      21.1       16.8                     25.7
                                                        15.1                1488  1345    225
     ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE 12/78         END DATE  1/79
                       THE ABOVE FIGURES ARE FOR THE PERIOD DECEMBER THROUGH JANUARY.

           START DATE  1/79         END DATE  1/79
                       THE UTILITY REPORTED THAT THE A-TOWER WAS OUT OF SERVICE FOR A PERIOD IN
                       JANUARY DUE TO BROKEN INLET ISOLATION DAMPER CHAINS.

           START DATE  1/79         END DATE  1/79
                       A-TOWER WAS OUT OF SERVICE TO REPAIR A BOOSTER FAN SERVO MECHANISM.

           START DATE 12/78         END DATE 12/78
                       THE B-TOWER WAS OUT OF SERVICE DURING DECEMBER DUE TO PLUGGING OF THE
                       THICKENER UNDERFLOW BY RUBBER LINING.  THE THICKENER WAS PUMPED OUT AND
                       REPAIRED.

           START DATE 12/78         END DATE  1/79
                       THE B-TOWER WAS OUT OF SERVICE THROUGH JANUARY DUE TO A FAN MOTOR.

 2/79   SYSTEM
                                                                            672
```

```
---------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
 3/79  A
       B
       SYSTEM
                                                                            1416  1034

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  3/79
                        THE ABOVE FIGURES ARE FOR THE PERIOD FEBRUARY THROUGH MARCH.

            START DATE  2/79        END DATE  3/79
                        A BOOSTER FAN MOTOR FIRE WAS EXPERIENCED.

            START DATE  2/79        END DATE  3/79
                        HOLES IN THE ABSORBER TOWER WERE REPAIRED.

 4/79  SYSTEM
                                                                             720

 5/79  A           3.0         3.2
       B          57.1        61.6                        3.0
       SYSTEM     30.0        32.4                       57.1
                                                         30.0               1464  1358    440

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79        END DATE  5/79
                        THE ABOVE FIGURES ARE FOR THE PERIOD APRIL THROUGH MAY.

 6/79  A          17.2        17.2
       B          36.3        36.3                       17.2
       SYSTEM     26.7        26.7                       36.3
                                                         26.7                720   720    192

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  6/79        END DATE  6/79
                        THE A-TOWER WAS DOWN FOR REPAIR TO THE FLAKE LINING.

            START DATE  6/79        END DATE  6/79
                        A-TOWER TRAY RECYCLE DISTRIBUTION HEADER WAS CLEANED.

            START DATE  6/79        END DATE  6/79
                        THE SYSTEM WAS FORCED OUT OF SERVICE WHEN BOILER PROBLEMS CAUSED AN EX-
                        CESSIVE AMOUNT OF HEAVY PARTICLES TO ENTER THE FGD SYSTEM RESULTING IN THE
                        PLUGGING OF SEVERAL LINES AND STOPPING THE THICKENER RAKE.

            START DATE  6/79        END DATE  6/79
                        THE A-TOWER WAS OUT OF SERVICE DUE TO PROBLEMS WITH THE WATER BALANCE AND E
                        THE VACUUM FILTERS AS WELL AS TO UNPLUG THE ABSORBER BLEED LINE.  LIME
                        WAS USED FOR SEVERAL DAYS TO EASE THE HIGH SOLIDS PROBLEM.

 7/79  A          44.5        44.5
       B            .0          .0                       44.5
       SYSTEM     44.0        44.0        44.0             .0
                                                         44.0                744   744    331

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  7/79
                        THE UTILITY HAS REPORTED THAT THE TRAY RECYCLE VALVE AND THE ABSORBER
                        TRAIN VALVE FAILED DURING SEPTEMBER.

            START DATE  7/79        END DATE  7/79
                        THE UTILITY REPORTED PROBLEMS WITH PLUGGING IN THE MIST ELIMINATORS,
                        THE THICKENER AND IN THE ABSORBER FEED LINE.

            START DATE  7/79        END DATE  7/79
                        THE UNIT EXPERIENCED A BOOSTER FAN TRIP.

            START DATE  7/79        END DATE  7/79
                        PROBLEMS WITH THE VACUUM FILTERS AND THE SEAL WATER PUMP WERE ENCOUNTERED.

            START DATE  7/79        END DATE  7/79
```

```
--------------------------------------PERFORMANCE DATA------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
                     THE ABSORBER AGITATOR WAS REPLACED DURING THE THIRD QUARTER.
 8/79  A             28.8        28.8
       B             10.6        10.6                    28.8
       SYSTEM        39.0        39.0                    10.6
                                             39.0        39.0
                                                                             744   744    293
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  8/79         END DATE  8/79
                         DURING AUGUST HIGH VIBRATIONS AND BEARING TEMPERATURE IN THE BOOSTER FAN
                         WERE ENCOUNTERED CAUSING SOME DOWN TIME.

             START DATE  8/79         END DATE  8/79
                         THE INABILITY TO ADD ALKALI, FLYASH OR LIME TO THE SYSTEM CAUSED SOME
                         OPERATIONAL PROBLEMS.

             START DATE  8/79         END DATE  8/79
                         DURING AUGUST THE THICKENER RAKE WAS BURIED IN THE SLUDGE AND ALL OF THE
                         SLUDGE HAD TO BE REMOVED BY MINING IT FROM THE TOP.

             START DATE  8/79         END DATE  8/79
                         PLUGGING OF THE FLYASH TANK AND THE LIME SLURRY FEED LINE CAUSED SOME
                         OUTAGE TIME DURING AUGUST.

             START DATE  8/79         END DATE  8/79
                         DUE TO A LACK OF LIME THE SYSTEM HAD TO GO OFF LINE.

             START DATE  8/79         END DATE  8/79
                         THE HOLES IN THE SIDES OF THE ABSORBER TOWER HAD TO BE REPAIRED CAUSING
                         AN OUTAGE.
 9/79  A             21.4        21.4
       B              1.2         1.2                    21.4
       SYSTEM        23.0        23.0                     1.2
                                             23.0        23.0
                                                                             720   717    163
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  9/79         END DATE  9/79
                         DURING SEPTEMBER THE A-SIDE WAS DOWN DUE TO HEAVY SOLIDS IN THE THICKENER
                         AND CLARIFIER.  HIGH VIBRATIONS WERE EXPERIENCED WITH THE BOOSTER FAN.
             START DATE  9/79         END DATE  9/79
                         THE B-SIDE REMAINED OUT OF SERVICE DUE TO PROBLEMS WITH THE THICKENER AND
                         CLARIFIER.
```

```
                                   EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

                                              SECTION 3
                          DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
----------------------------------------------------------------------------------------------------------------
  COMPANY NAME
  PLANT NAME                                          MONTANA POWER
  UNIT NUMBER                                         COLSTRIP
  CITY                                                1
  STATE                                               COLSTRIP
  GROSS UNIT GENERATING CAPACITY - MW                 MONTANA
  NET UNIT GENERATING CAPACITY W/FGD - MW               360.0
  EQUIVALENT SCRUBBED CAPACITY - MW                     332.0
                                                        360.0
 ** FUEL DATA
     FUEL TYPE
     FUEL GRADE                                       COAL
     AVERAGE HEAT CONTENT - J/G                       SUBBITUMINOUS
     AVERAGE ASH CONTENT - %                           20569.        ( 8843 BTU/LB)
     AVERAGE MOISTURE CONTENT - %                         8.60
     AVERAGE SULFUR CONTENT - %                          23.90
     AVERAGE CHLORIDE CONTENT - %                          .77
                                                           .01
 ** FGD SYSTEM
     GENERAL PROCESS TYPE
     PROCESS TYPE                                     WET SCRUBBING
     SYSTEM SUPPLIER                                  LIME/ALKALINE FLYASH
     NEW/RETROFIT                                     ADL/COMBUSTION EQUIP ASSOCIATE
     ENERGY CONSUMPTION - %                           NEW
     INITIAL START-UP DATE                                3.3
     COMMERCIAL START-UP DATE                          9/75
     SO2 DESIGN REMOVAL EFFICIENCY - %                11/75
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %           60.00
     ABSORBER SPARE CAPACITY INDEX - %                   99.50
     ABSORBER SPARE COMPONENTS INDEX                     20.0
                                                           .5
 ** WATER LOOP
     TYPE
     FRESH MAKE-UP WATER - LITER/S                    CLOSED
                                                        23.3         ( 370 GPM)
 ** DISPOSAL
     TYPE
                                                      POND

-------------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
12/78  SYSTEM     96.7

 1/79  SYSTEM     97.6                                                       744

 2/79  SYSTEM     90.3                                                       744

 3/79  SYSTEM     97.3                                                       672

 4/79  SYSTEM     98.9        88.4                                           744
                                                    80.2
 5/79  SYSTEM     89.7                                                       720          597

 6/79  SYSTEM     95.2                                                       744

       ** PROBLEMS/SOLUTIONS/COMMENTS                                        720

            START DATE   5/79        END DATE  6/79
                         DURING MAY AND JUNE THE UNIT WAS BEING OVERHAULED.  THE AVAILABILITY FOR
                         THESE PERIODS IS BASED UPON OPERATIONS BEFORE AND AFTER OVERHAUL.
 7/79  SYSTEM

 8/79  SYSTEM                                                                744

 9/79  SYSTEM                                                                744

                                                                             720
```

```
-----------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  9/79
                        NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THE THIRD QUARTER 1979.
```

```
                                                    SECTION 3
                              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-------------------------------------------------------------------------------------------------------------------
 COMPANY NAME
 PLANT NAME                                            MONTANA POWER
 UNIT NUMBER                                           COLSTRIP
 CITY                                                  2
 STATE                                                 COLSTRIP
 GROSS UNIT GENERATING CAPACITY - MW                   MONTANA
 NET UNIT GENERATING CAPACITY W/FGD - MW                 360.0
 EQUIVALENT SCRUBBED CAPACITY - MW                       332.0
                                                         360.0
 ** FUEL DATA
      FUEL TYPE
      FUEL GRADE                                       COAL
      AVERAGE HEAT CONTENT - J/G                       SUBBITUMINOUS
      AVERAGE ASH CONTENT - %                           20569.        (  8843 BTU/LB)
      AVERAGE MOISTURE CONTENT - %                          8.60
      AVERAGE SULFUR CONTENT - %                           23.90
      AVERAGE CHLORIDE CONTENT - %                           .77
                                                             .01
 ** FGD SYSTEM
      GENERAL PROCESS TYPE
      PROCESS TYPE                                     WET SCRUBBING
      SYSTEM SUPPLIER                                  LIME/ALKALINE FLYASH
      NEW/RETROFIT                                     ADL/COMBUSTION EQUIP ASSOCIATE
      ENERGY CONSUMPTION - %                           NEW
      INITIAL START-UP DATE                                3.3
      COMMERCIAL START-UP DATE                          5/76
      SO2 DESIGN REMOVAL EFFICIENCY - %                10/76
      PARTICULATE DESIGN REMOVAL EFFICIENCY - %            60.00
      ABSORBER SPARE CAPACITY INDEX - %                    99.50
      ABSORBER SPARE COMPONENTS INDEX                      20.0
                                                             .5
 ** WATER LOOP
      TYPE
      FRESH MAKE-UP WATER - LITER/S                    CLOSED
                                                          23.3        (  370 GPM)
 ** DISPOSAL
      TYPF
                                                       POND


-----------------------------------------PERFORMANCE DATA--------------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
12/78  SYSTEM     91.2
                                                                            744
 1/79  SYSTEM     94.3
                                                                            744
 2/79  SYSTEM     98.3
                                                                            672
 3/79  SYSTEM     94.3
                                                                            744
 4/79  SYSTEM    100.0
                                                                            720
       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  4/79        END DATE  4/79
                          DURING APRIL THE UNIT WAS BEING OVERHAULED.  THE AVAILABILITY FOR THIS
                          TIME IS BASED UPON OPERATIONS BEFORE AND AFTER THE OVERHAUL.
 5/79  SYSTEM     94.4
                                                                            744
 6/79  SYSTEM     98.4
                                                                            720
 7/79  SYSTEM
                                                                            744
 8/79  SYSTLM
                                                                            744
 9/79  SYSTEM
                                                                            720
```

MONTANA POWER: COLSTRIP 2 (CONT.)

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  7/79        END DATE  9/79
                         NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THE THIRD QUARTER 1979.
```

```
                                   SECTION 3
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------------------

 COMPANY NAME
 PLANT NAME                                         NEVADA POWER
 UNIT NUMBER                                        REID GARDNER
 CITY                                               1
 STATE                                              MOAPA
 GROSS UNIT GENERATING CAPACITY - MW                NEVADA
 NET UNIT GENERATING CAPACITY W/FGD - MW              125.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    110.0
                                                      125.0
 ** FUEL DATA
     FUEL TYPE
     FUEL GRADE                                     COAL
     AVERAGE HEAT CONTENT - J/G                     BITUMINOUS
     AVERAGE ASH CONTENT - %                         28959.       ( 12450 BTU/LB)
     AVERAGE MOISTURE CONTENT - %                       8.00
     AVERAGE SULFUR CONTENT - %                     ********
     AVERAGE CHLORIDE CONTENT - %                        .50
                                                         .05
 ** FGD SYSTEM
     GENERAL PROCESS TYPE
     PROCESS TYPE                                   WET SCRUBBING
     SYSTEM SUPPLIER                                SODIUM CARBONATE
     NEW/RETROFIT                                   ADL/COMBUSTION EQUIP ASSOCIATE
     ENERGY CONSUMPTION - %                         RETROFIT
     INITIAL START-UP DATE                          *******
     COMMERCIAL START-UP DATE                        4/74
     SO2 DESIGN REMOVAL EFFICIENCY - %              **/**
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %        90.00
     ABSORBER SPARE CAPACITY INDEX - %                97.00
     ABSORBER SPARE COMPONENTS INDEX                     .0
                                                         .0
 ** WATER LOOP
     TYPE
     FRESH MAKE-UP WATER - LITER/S                  CLOSED
                                                       9.8         ( 155 GPM)
 ** DISPOSAL
     TYPE
                                                    POND


-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                               ----- ----- ----- ------ ----- ------
 3/79  SYSTEM      97.9          96.5        96.5        78.3
                                                                           744    603    582
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  3/79         END DATE  3/79
                        THE FGD SYSTEM WAS OFF TO UNPLUG VENTURI NOZZLES AND TO CLEAN SENSING
                        LINES.  THE DOWNTIME WAS ABOUT 15 HOURS.

            START DATE  3/79         END DATE  3/79
                        THE FGD SYSTEM WAS OFF FOR ABOUT 146 HOURS FOR REPAIR OF BOILER TUBE
                        LEAKS.
 4/79  SYSTEM     100.0          98.7        98.6        25.7
                                                                           720    188    185
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79         END DATE  4/79
                        THE BOILER AND FGD SYSTEM WERE OFF FOR APPROXIMATELY 533 HOURS FOR SCHED-
                        ULED MAINTENANCE.
 5/79  SYSTEM      99.8          74.4        74.4        27.5
                                                                           744    275    204
```

NEVADA POWER: REID GARDNER 1 (CONT.)

```
-------------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  5/79
                        THE BOILER AND SCRUBBER WERE RETURNED TO SERVICE ON THE 22ND AFTER
                        MAINTENANCE.

            START DATE  5/79        END DATE  5/79
                        THE BOILER WAS FORCED OUT OF SERVICE TO REPAIR A COAL LEAK ON THE #8
                        BURNER LINE.

 6/79  SYSTEM      97.7         95.1        95.2         84.7                     720   641    610

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  6/79        END DATE  6/79
                        A FEW DAYS OUTAGE TIME WAS REQUIRED TO REPAIR A BOILER TUBE LEAK.

            START DATE  6/79        END DATE  6/79
                        OUTAGE TIME WAS REQUIRED TO UNPLUG A VENTURI LINE.

            START DATE  6/79        END DATE  6/79
                        TRAY SPRAY VALVES WERE REPLACED DURING JUNE.

 7/79  SYSTEM      81.2         80.5        80.5         80.3                     744   742    598

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  7/79
                        THE BOILER AND FGD SYSTEM WAS TRIPPED OFF FOR TURBINE OVERSPEED GOVERNOR
                        TEST.  THE DOWNTIME WAS ABOUT 7 HOURS.

            START DATE  7/79        END DATE  7/79
                        THE SCRUBBER WAS OFF ABOUT 67 HOURS TO CLEAN THE SCRUBBER TRAYS.

            START DATE  7/79        END DATE  7/79
                        LOST INSTRUMENT AIR TO THE SCRUBBER CONTROLS CAUSED A LOSS OF POWER TO THE
                        SCRUBBER AIR COMPRESSOR.  THE SCRUBBER WAS OFF-LINE FOR ABOUT 74 HOURS.

 8/79  SYSTEM      96.8         96.8        96.8         96.8                     744   744    721

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  8/79        END DATE  8/79
                        THE SCRUBBER WAS REMOVED FROM SERVICE TO CLEAN THE SCRUBBER PRESSURE
                        SENSING LINES.  THE SCRUBBER WAS DOWN FOR ABOUT 11 HOURS.

            START DATE  8/79        END DATE  8/79
                        THE SCRUBBER WAS DOWN AT THE END OF THE MONTH TO CLEAN THE PRESSURE
                        SENSING LINE ON THE SCRUBBER.  THE SCRUBBER WAS OFF-LINE FOR ABOUT 4 HOURS.

 9/79  SYSTEM     100.0        100.0       100.0         53.2                     720   383    383

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  9/79        END DATE  9/79
                        IN SEPTEMBER THE SCRUBBER WENT OFF WITH THE BOILER AND TURBINE FOR
                        SCHEDULED MAINTENANCE.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
-----------------------------------------------------------------------------------------------------
COMPANY NAME                                        NEVADA POWER
PLANT NAME                                          REID GARDNER
UNIT NUMBER                                         2
CITY                                                MOAPA
STATE                                               NEVADA
GROSS UNIT GENERATING CAPACITY - MW                   125.0
NET UNIT GENERATING CAPACITY W/FGD - MW               110.0
EQUIVALENT SCRUBBED CAPACITY - MW                     125.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       28842.        ( 12400 BTU/LB)
    AVERAGE ASH CONTENT - %                             8.00
    AVERAGE MOISTURE CONTENT - %                    ********
    AVERAGE SULFUR CONTENT - %                           .50
    AVERAGE CHLORIDE CONTENT - %                         .05

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    SODIUM CARBONATE
    SYSTEM SUPPLIER                                 ADL/COMBUSTION EQUIP ASSOCIATE
    NEW/RETROFIT                                    RETROFIT
    ENERGY CONSUMPTION - %                          *******
    INITIAL START-UP DATE                           4/74
    COMMERCIAL START-UP DATE                        **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                  90.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          97.00
    ABSORBER SPARE CAPACITY INDEX - %                     .0
    ABSORBER SPARE COMPONENTS INDEX                       .0

** WATER LOOP
    TYPE                                            CLOSED
    FRESH MAKE-UP WATER - LITER/S                      9.8        (  155 GPM)

** DISPOSAL
    TYPE                                            POND

---------------------------------------------PERFORMANCE DATA----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 3/79  SYSTEM     97.8         96.6        96.6        89.2                  744   688    665

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  3/79         END DATE  3/79
                          THE BOILER AND SCRUBBER WERE OFF FOR ABOUT TWO DAYS FOR REPAIR OF BOILER
                          TUBE LEAKS.

              START DATE  3/79         END DATE  3/79
                          THE BOILER TRIPPED DUE TO HIGH FURNACE PRESSURE.  WHILE THE BOILER WAS
                          DOWN SENSING LINES WERE CLEANED ON THE SCRUBBER.
 4/79  SYSTEM     88.8         95.9        96.0        88.8                  720   666    640

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  4/79         END DATE  4/79
                          A HIGH PRESSURE ALARM ON THE SCRUBBER DUCT TRIPPED THE SCRUBBER OFF LINE.
                          THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED.  THIS OCCURRED TWICE
                          DURING THE MONTH OF APRIL.

              START DATE  4/79         END DATE  4/79
                          A CONTROL POWER FAILURE OCCURRED CAUSING A SCRUBBER TRIP WHEN THE 10 KW
                          GENERATOR WAS PUT BACK IN SERVICE.
 5/79  SYSTEM     99.8         99.4        99.5        83.9                  744   627    624
```

NEVADA POWER: REID GARDNER 2 (CONT.)

```
-------------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER  FGD    CAP.
                                                                SO2  PART.  HOURS HOURS  HOURS  FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- -----  ----- ------ -----  ------
        ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  5/79          END DATE  5/79
                           THE BOILER WAS OUT OF SERVICE FOR ABOUT 5 DAYS TO REPAIR TUBE LEAKS.

               START DATE  5/79          END DATE  5/79
                           PRESSURE SENSING LINES ON THE SCRUBBER CONTROLS WERE CLEANED.

 6/79  SYSTEM      93.2         86.8        86.9        73.2                      720    607     527

        ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  6/79          END DATE  6/79
                           THE SCRUBBER WAS FORCED OUT OF SERVICE DUE TO VENTURI PUMP POWER LOSS.

               START DATE  6/79          END DATE  6/79
                           SOME OUTAGE TIME WAS REQUIRED TO REPAIR VENTURI PUMP DISCHARGE VALVES.

               START DATE  6/79          END DATE  6/79
                           SOME BOILER OUTAGE WAS REQUIRED DURING JUNE TO REPAIR HIGH PRESSURE HEATER
                           TUBE LEAKS, TO WELD A CAP ON THE HIGH PRESSURE HEATER, TO WORK ON PRIMARY
                           AIR FANS, AND TO REPAIR A BOILER TUBE LEAK.

               START DATE  6/79          END DATE  6/79
                           SCRUBBER OUTAGE TIME WAS REQUIRED TO CLEAN PRESSURE SENSING LINES.

 7/79  SYSTEM      86.8         90.6        85.5        78.1                      744    642     646

        ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  7/79          END DATE  7/79
                           THE SCRUBBER WAS OFF AT THE START OF THE MONTH WITH A BAD VENTURI PROBE
                           TEMPERATURE AND A BLOWN BOILER TUBE.  THIS OUTAGE LASTED ABOUT 76 HOURS.

               START DATE  7/79          END DATE  7/79
                           THE BOILER AND SCRUBBER WAS OFF TO REPAIR BOILER TUBE LEAK.

               START DATE  7/79          END DATE  7/79
                           SCRUBBER AND BOILER TRIPPED OFF FOR ABOUT 50 HOURS.  THIS OUTAGE WAS CAUSED
                           BY LOST CONTROL AIR TO THE SCRUBBER AND POWER LOSS TO SCRUBBER AIR
                           COMPRESSOR.

               START DATE  7/79          END DATE  7/79
                           THE SENSING LINES ON THE SCRUBBER WERE CLEANED TO PREVENT HIGH SCRUBBER
                           DUCT PRESSURE.  THE SYSTEM WAS OFF FOR ABOUT 16 HOURS.

 8/79  SYSTEM      93.2         98.9        93.2        93.1                      744    701     694

        ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  8/79          END DATE  8/79
                           THE SCRUBBER AND THE BOILER WENT DOWN FOR ABOUT 40 HOURS TO REPAIR A
                           BOILER TUBE LEAK.

               START DATE  8/79          END DATE  8/79
                           THE SCRUBBER WAS OFF TO REPAIR LEAK IN VENTURI PUMP DISCHARGE BODY.  THE
                           REPAIR TOOK ABOUT 9 HOURS.

               START DATE  8/79          END DATE  8/79
                           HIGH PRESSURE IN SCRUBBER DUCT CAUSED THE SCRUBBER TO GO DOWN TO CLEAN THE
                           SCRUBBER PRESSURE SENSING LINES.

 9/79  SYSTEM      85.8         83.7        82.3        66.2                      720    569     477

        ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  9/79          END DATE  9/79
                           DURING SEPTEMBER THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPAIR
                           BOILER TUBE LEAKS.  THIS OCCURRED TWICE CAUSING A TOTAL OF 126 HOURS OF
```

```
-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                    DOWN TIME.

          START DATE  9/79          END DATE  9/79
                    SOME OUTAGE TIME WAS REQUIRED TO UNPLUG EFFLUENT AND VENTURI LINES AND
                    TO CLEAN THE VENTURI RACE TRACK.

          START DATE  9/79          END DATE  9/79
                    HIGH PRESSURE WAS ENCOUNTERED TWICE IN THE SCRUBBER DUCT AND ONCE IN THE
                    BOILER FURNACE.  THIS CAUSED SOME OUTAGE TIME TO CLEAN THE SCRUBBER
                    PRESSURE SENSING LINES.

          START DATE  9/79          END DATE  9/79
                    THE SCRUBBER WAS DOWN WITH THE BOILER SO REPAIRS TO THE MAIN STEAM DRAIN
                    LINE COULD BE CONDUCTED.

          START DATE  9/79          END DATE  9/79
                    THE SCRUBBER WAS DOWN FOR APPROXIMATELY 7 HOURS TO WORK ON THE CONTROLS.
```

```
                                       SECTION 3
                   DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------

 COMPANY NAME                                        NEVADA POWER
 PLANT NAME                                          REID GARDNER
 UNIT NUMBER                                         3
 CITY                                                MOAPA
 STATE                                               NEVADA
 GROSS UNIT GENERATING CAPACITY - MW                   125.0
 NET UNIT GENERATING CAPACITY W/FGD - MW               110.0
 EQUIVALENT SCRUBBED CAPACITY - MW                     125.0

 ** FUEL DATA
     FUEL TYPE                                       COAL
     FUEL GRADE                                      BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                       28959.        ( 12450 BTU/LB)
     AVERAGE ASH CONTENT - %                              8.00
     AVERAGE MOISTURE CONTENT - %                    ********
     AVERAGE SULFUR CONTENT - %                            .50
     AVERAGE CHLORIDE CONTENT - %                          .05

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                            WET SCRUBBING
     PROCESS TYPE                                    SODIUM CARBONATE
     SYSTEM SUPPLIER                                 ADL/COMBUSTION EQUIP ASSOCIATE
     NEW/RETROFIT                                    NEW
     ENERGY CONSUMPTION - %                          *******
     INITIAL START-UP DATE                            6/76
     COMMERCIAL START-UP DATE                         7/76
     SO2 DESIGN REMOVAL EFFICIENCY - %                  85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.00
     ABSORBER SPARE CAPACITY INDEX - %                    .0
     ABSORBER SPARE COMPONENTS INDEX                      .0

 ** WATER LOOP
     TYPE                                            CLOSED
     FRESH MAKE-UP WATER - LITER/S                      9.8        (  155 GPM)

 ** DISPOSAL
     TYPE                                            POND


----------------------------------------PERFORMANCE DATA----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 3/79  SYSTEM      100.0        97.9        100.0        67.7                744   246    241

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  3/79         END DATE  3/79
                       THE BOILER AND FGD SYSTEM WERE OFF FOR ABOUT 2 DAYS TO REPAIR AND BALANCE
                       A BOILER I.D. FAN.

           START DATE  3/79         END DATE  3/79
                       THE BOILER AND FGD SYSTEM WERE OFF FOR ABOUT 19 DAY FOR SCHEDULED MAIN-
                       TENANCE.

 4/79  SYSTEM      100.0       100.0        100.0       100.0                720   719    719

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  4/79         END DATE  4/79
                       NO OUTAGES WERE REPORTED FOR APRIL.

 5/79  SYSTEM       98.7        97.7         97.7        97.5                744   742    725
```

```
-----------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/79          END DATE  5/79
                         THE SCRUBBER WAS INADVERTENTLY REMOVED FROM SERVICE FOR A FEW HOURS.

             START DATE  5/79          END DATE  5/79
                         THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED AFTER A BOILER TRIP
                         ON HIGH FURNACE PRESSURE.

6/79   SYSTEM     100.0         91.3        100.0        83.5                    720   659    601

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  6/79          END DATE  6/79
                         SOME BOILER OUTAGE WAS REQUIRED DURING JUNE TO REPAIR A BOILER TUBE LEAK.

             START DATE  6/79          END DATE  6/79
                         THE SCRUBBER WAS OUT OF SERVICE WHILE REPAIRS WERE MADE ON THE FIRE WATER
                         SYSTEM.

7/79   SYSTEM      93.2         93.1         93.2        93.2                    744   642    694

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  7/79          END DATE  7/79
                         THE VENTURI RECYCLE PUMP HAD A BAD PUMP CASING LEAK CAUSING ABOUT 50 HOURS
                         OFF TIME.

             START DATE  7/79          END DATE  7/79
                         THE VENTURI PUMP WAS OUT OF SERVICE FOR MAINTENANCE.

8/79   SYSTEM      87.6         92.9         87.6        87.5                    744   701    652

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  8/79          END DATE  8/79
                         THE SCRUBBER AND BOILER WERE BOTH DOWN TO REPLACE THE EXPANSION JOINTS ON
                         THE CIRCULATING WATER PUMPS.

             START DATE  8/79          END DATE  8/79
                         THE SCRUBBER WAS OFF TO CLEAN TRAY AND VENTURI RACE TRACK NOZZLES.  THE
                         SCRUBBER WAS DOWN FOR ABOUT 31 HOURS.

             START DATE  8/79          END DATE  8/79
                         THE SCRUBBER WAS OFF TO REPAIR BROKEN FIRE LINES SO THE SCRUBBER WILL HAVE
                         EMERGENCY WATER.

9/79              100.0         98.8        100.0        90.2
       SYSTEM
                                                                                 720   657

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  9/79          END DATE  9/79
                         DURING SEPTEMBER THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPAIR
                         BOILER TUBE LEAKS.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NORTHERN INDIANA PUB SERVICE	
PLANT NAME	DEAN H. MITCHELL	
UNIT NUMBER	11	
CITY	GARY	
STATE	INDIANA	
GROSS UNIT GENERATING CAPACITY - MW	115.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	94.0	
EQUIVALENT SCRUBBED CAPACITY - MW	115.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
AVERAGE ASH CONTENT - %	********	
AVERAGE MOISTURE CONTENT - %	11.00	
AVERAGE SULFUR CONTENT - %	3.50	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY POWERGAS	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	-72.3	
INITIAL START-UP DATE	7/76	
COMMERCIAL START-UP DATE	6/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	98.50	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** BYPRODUCT		
BYPRODUCT NATURE	ELEMENTAL SULFUR	
DISPOSITION		

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	7.0		1.0	1.0			720		5	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 2/79
THE BOILER OPERATED ON LOW SULFUR COAL FEBRUARY 1-12 AND HIGH SULFUR COAL FEBRUARY 13-MARCH 2. THE FGD SYSTEM REMAINED DOWN THROUGH FEBRUARY 22 FOR COMPLETION OF SULFUR CONDENSER REPAIRS FOLLOWED BY REPAIR OF EXPANSION JOINT LEAKS.

START DATE 2/79 END DATE 2/79
A POWER INTERRUPTION ON FEBRUARY 24 RESULTED IN LOSS OF SEAL WATER TO THE EVAPORATOR PUMP AND PACKING FAILURE. THE FGD SYSTEM REMAINED DOWN THROUGH MARCH 2.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM	47.0		44.0	43.0			720		308	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79
THE BOILER OPERATED ON HIGH SULFUR COAL DURING THE MONTH.

START DATE 3/79 END DATE 3/79
THE FGD SYSTEM WAS SHUT DOWN DUE TO HIGH LEAKAGE IN THE EVAPORATOR CIR-

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

```
--------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                         CULATING PUMP PACKING GLAND.  THE PUMP SHAFT SLEEVE WAS REPLACED AND THE
                         PUMP REALIGNED.  THE SYSTEM WAS DOWN FOR ABOUT 16 DAYS.

 4/79  SYSTEM      73.0                    73.0       73.0                     720          527

 5/79  SYSTEM      86.0                    76.0       69.0                     744          499

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  4/79        END DATE  5/79
                         FGD OUTAGES IN THE EVAPORATOR SYSTEM RESULTED FROM HIGH VIBRATION IN THE
                         CIRCULATING PUMP, PARTIAL PLUGGING OF THE HEATER TUBES AND A LEAK IN THE
                         SO2 SUPERHEATER.  FGD OUTAGES IN THE SO2 REDUCTION SYSTEM RESULTED FROM
                         PLUGGING OF THE TAIL GAS LINE AND MALFUNCTION OF THE INCINERATOR COM-
                         BUSTION CONTROLS.

             START DATE  5/79        END DATE  5/79
                         BOILER OUTAGES WERE REQUIRED FOR REPAIR OF A TUBE LEAK AND FOR REPAIR OF
                         A STEAM STOP VALVE.

 6/79  SYSTEM      91.0                    80.0       63.0                     720          455

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  6/79        END DATE  6/79
                         THE UNIT 11 BOILER OPERATED PART OF THE PERIOD ON HIGH SULFUR COAL AND
                         PART ON A MIXTURE OF HIGH AND MEDIUM SULFUR COAL.

             START DATE  6/79        END DATE  6/79
                         AN OUTAGE WAS REQUIRED FOR REPAIR OF A REHEAT STOP VALVE AND THE OPERATINGE
                         RATE WAS LIMITED DUE TO AN ID FAN BEARING PROBLEM AND AN FD FAN FAILURE.
                         LOW MAIN STEAM PRESSURE LOW SO2 IN THE FLUE GAS CAUSED FGD OUTAGES.  FGD
                         OUTAGES ALSO RESULTED FROM A FLUE LEAK, A PLUGGED WATER VALVE AND REPAIR
                         OF AN EXPANSION JOINT.

 7/79  SYSTEM      90.0                    82.0       79.0                     682          538

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  7/79        END DATE  7/79
                         UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL.  OUTAGES OCCURRED FOR REPACK-
                         ING OF THE STEAM PRV VALVE WHICH SUPPLIES FGD AND AN ELECTRICAL GROUND.
                         SPECIAL TESTING OF THE UNIT 11 BOILER - FGD SYSTEM WAS CONDUCTED BY TRW
                         FOR EPA FROM JULY 17-28 WHICH REQUIRED THAT THE UNIT 11 RATE BE VARIED AND
                         THAT THE SO2 REDUCTION UNIT BE DOWN FOR A PORTION OF THE PERIOD.  IN
                         ADDITION TO THE FGD OUTAGE REQUIRED BY THE TRW TESTING, FGD OUTAGES
                         RESULTED FROM INSPECTION OF THE BOOSTER BLOWER SPEED REDUCER AND HIGH FLOW
                         RESISTANCE IN THE SO2 REDUCTION UNIT.

 8/79  SYSTEM                                                                  744

 9/79  SYSTEM                                                                  720

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  8/79        END DATE  9/79
                         NO DATA WAS AVAILABLE FOR THE MONTHS OF AUGUST AND SEPTEMBER.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER
PLANT NAME	SHERBURNE
UNIT NUMBER	1
CITY	BECKER
STATE	MINNESOTA
GROSS UNIT GENERATING CAPACITY - MW	740.0
NET UNIT GENERATING CAPACITY W/FGD - MW	700.0
EQUIVALENT SCRUBBED CAPACITY - MW	740.0

**** FUEL DATA**

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19771.	(8500 BTU/LB)
AVERAGE ASH CONTENT - %	9.00	
AVERAGE MOISTURE CONTENT - %	25.00	
AVERAGE SULFUR CONTENT - %	.80	
AVERAGE CHLORIDE CONTENT - %	.03	

**** FGD SYSTEM**

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	2.7
INITIAL START-UP DATE	3/76
COMMERCIAL START-UP DATE	5/76
SO2 DESIGN REMOVAL EFFICIENCY - %	50.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	8.0
ABSORBER SPARE COMPONENTS INDEX	.9

**** WATER LOOP**

TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)

**** TREATMENT**

TYPE	FORCED OXIDATION

**** DISPOSAL**

TYPE	LINED POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	101		78.0		78.0						
	102		73.0		73.0						
	103		70.0		70.0						
	104		76.0		76.0						
	105		50.0		50.0						
	106		91.0		91.0						
	107		92.0		92.0						
	108		92.0		92.0						
	109		75.0		75.0						
	110		77.0		77.0						
	111		66.0		66.0						
	112		93.0		93.0						
	SYSTEM	89.0	100.0		100.0			672	672	672	67.9
3/79	101		61.0		60.1						
	102		88.0		86.8						
	103		45.0		44.4						
	104		86.0		84.8						
	105		94.0		92.7						
	106		71.0		70.0						
	107		91.0		89.8						

Reproduced from best available copy.

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

```
---------------------------------------PERFORMANCE DATA---------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
       108                     73.0                             ----- ----- ----- ------ ----- ------
       109                     91.0                     72.0
       110                     80.0                     89.8
       111                     89.0                     78.9
       112                     80.0                     67.8
       SYSTEM      92.0                                 78.9
                                                                              744   734           59.4
       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  2/79         END DATE  3/79
                          THE ONLY MAJOR PROBLEM REPORTED BY THE UTILITY WAS BOILER RELATED -
                          SPECIFICALLY PROBLEMS WITH WET COAL.

              START DATE  3/79         END DATE  3/79
                          CURRENTLY THE UTILITY IS INCREASING THE RECYCLE PUMP CAPACITY BY INSTAL-
                          LING 8000 GPM WORTHINGTON RECYCLE PUMPS.  DURING THIS PERIOD THEY HAVE
                          BEEN INSTALLED ON MODULES 101,103,104,105,107, AND 110.
 4/79  SYSTEM      93.0
                                                                              720   622
 5/79  SYSTEM      98.0
                                                                              744   678
       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  4/79         END DATE  5/79
                          THE UTILITY WILL NOW REPORT THE TOTAL SYSTEM AVAILABILITY ONLY.

              START DATE  4/79         END DATE  5/79
                          THE UTILITY HAD NO OPERATIONAL DIFFICULTIES TO REPORT.
 6/79  SYSTEM      93.0
                                                                              720   701
       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  6/79         END DATE  6/79
                          THE UTILITY REPORTED THAT SOME GENERAL PLUGGING WAS EXPERIENCED DURING
                          JUNE BUT IT WAS NOT SERIOUS.
 7/79  SYSTEM      93.0
                                                                              744   695
 8/79  SYSTEM      95.0
                                                                              744   744
 9/79  SYSTEM      92.0
                                                                              720   166
       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  9/79         END DATE  9/79
                          ON SEPTEMBER 8 THE UNIT WENT DOWN FOR THE ANNUAL BOILER/TURBINE INSPECTION
                          AND IS EXPECTED TO BE OFF LINE UNTIL THE LAST WEEK OF OCTOBER.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER
PLANT NAME	SHERBURNE
UNIT NUMBER	2
CITY	BECKER
STATE	MINNESOTA
GROSS UNIT GENERATING CAPACITY - MW	740.0
NET UNIT GENERATING CAPACITY W/FGD - MW	700.0
EQUIVALENT SCRUBBED CAPACITY - MW	740.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	19771. (8500 BTU/LB)
AVERAGE ASH CONTENT - %	9.00
AVERAGE MOISTURE CONTENT - %	25.00
AVERAGE SULFUR CONTENT - %	.80
AVERAGE CHLORIDE CONTENT - %	********
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	2.7
INITIAL START-UP DATE	4/77
COMMERCIAL START-UP DATE	4/77
SO2 DESIGN REMOVAL EFFICIENCY - %	50.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	8.0
ABSORBER SPARE COMPONENTS INDEX	.9
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	******* (***** GPM)
** TREATMENT	
TYPE	FORCED OXIDATION
** DISPOSAL	
TYPE	LINED POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	201		86.0								
	202		84.0								
	204		89.0								
	205		59.0								
	206		76.0								
	207		72.0								
	208		68.0								
	209		80.0								
	210		75.0								
	211		92.0								
	212		65.0								
	SYSTEM	93.0	100.0					672	671		
3/79	201		85.0								
	202		69.0								
	203		78.0								
	204		47.0								
	205		71.0								
	206		76.0								
	207		90.0								
	208		78.0								

```
NORTHERN STATES POWER: SHERBURNE 2 (CONT.)


------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
       209                     50.0
       210                     85.0
       211                     57.0
       212                     86.0
       SYSTEM       91.0      100.0
                                                                            744   744

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  3/79
                        THE ONLY REAL PROBLEMS ENCOUNTERED DURING THIS PERIOD WERE PROBLEMS WITH
                        WET COAL.

            START DATE  2/79        END DATE  3/79
                        THE RECYCLE PUMPS ARE BEING REPLACED WITH LARGER 8000 GPM WORTHINGTON
                        PUMPS.  DURING THIS PERIOD THE PUMPS WERE INSTALLED ON MODULES 204 AND
                        206.

 4/79  SYSTEM       99.0      100.0
                                                                            720   717

 5/79  SYSTEM       95.0      100.0
                                                                            744   263

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  5/79
                        THE LOW BOILER HOURS IN MAY WERE DUE TO COMMENCEMENT OF THE ANNUAL BOILER
                        AND TURBINE INSPECTION.

            START DATE  4/79        END DATE  5/79
                        ALL PIPING HAS BEEN CHANGED TO FIBERGLASS.

            START DATE  5/79        END DATE  5/79
                        THE UTILITY WILL NOW REPORT THE AVAILABILITY OF THE TOTAL SYSTEM ONLY.

 6/79  SYSTEM       90.0      100.0
                                                                            720   454

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  6/79        END DATE  6/79
                        THE ONLY PROBLEM REPORTED BY THE UTILITY WAS THE LOSS OF A BOILER SURGE
                        PUMP AFTER THE UNIT RESTARTED.

 7/79  SYSTEM       95.0
                                                                            744   741

 8/79  SYSTEM       96.0
                                                                            744   740

 9/79  SYSTEM       95.0
                                                                            720   657

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  9/79        END DATE  9/79
                        NO MAJOR OPERATIONAL PROBLEMS HAVE BEEN ENCOUNTERED WITH THIS UNIT SINCE
                        IT CAME BACK ON LINE AFTER THE ANNUAL BOILER/TURBINE OVERHAUL.
```

```
                                            SECTION 3
                       DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
--------------------------------------------------------------------------------------------------

 COMPANY NAME                                   PENNSYLVANIA POWER
 PLANT NAME                                     BRUCE MANSFIELD
 UNIT NUMBER                                    1
 CITY                                           SHIPPINGPORT
 STATE                                          PENNSYLVANIA
 GROSS UNIT GENERATING CAPACITY - MW              917.0
 NET UNIT GENERATING CAPACITY W/FGD - MW          825.0
 EQUIVALENT SCRUBBED CAPACITY - MW                917.0

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                  26749.         ( 11500 BTU/LB)
     AVERAGE ASH CONTENT - %                       12.90
     AVERAGE MOISTURE CONTENT - %                   7.00
     AVERAGE SULFUR CONTENT - %                     3.00
     AVERAGE CHLORIDE CONTENT - %               ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                       WET SCRUBBING
     PROCESS TYPE                               LIME
     SYSTEM SUPPLIER                            CHEMICO
     NEW/RETROFIT                               NEW
     ENERGY CONSUMPTION - %                         6.0
     INITIAL START-UP DATE                      12/75
     COMMERCIAL START-UP DATE                    6/76
     SO2 DESIGN REMOVAL EFFICIENCY - %             92.10
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     99.80
     ABSORBER SPARE CAPACITY INDEX - %               .0
     ABSORBER SPARE COMPONENTS INDEX                 .0

 ** WATER LOOP
     TYPE                                       OPEN
     FRESH MAKE-UP WATER - LITER/S              *******        (***** GPM)

 ** TREATMENT
     TYPE                                       CALCILOX

 ** DISPOSAL
     TYPE                                       LANDFILL


----------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2   PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                672

 3/79  SYSTEM                                                                744

 4/79  SYSTEM                                                                720

 5/79  SYSTEM                                                                744

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  2/79        END DATE  5/79
                         UNIT 1 IS CURRENTLY DOWN FOR A BOILER OUTAGE.

             START DATE  2/79        END DATE  5/79
                         SIX OF THE TWELVE FAN HOUSINGS HAVE BEEN CHANGED FROM CARBON STEEL TO
                         INCOLLOY 825.

 6/79  SYSTEM      92.0                                                     4344
```

```
------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  1/79          END DATE  6/79
                        THE ABOVE AVAILABILITY IS THE AVAILABILITY FROM JANUARY 1, 1979 THROUGH
                        MAY 31, 1979.

            START DATE  1/79          END DATE  6/79
                        THE UTILITY REPORTED THAT FAN MOTOR FAILURES WERE A MAJOR PROBLEM AREA
                        DURING THE FIRST HALF OF 1979.

 7/79  SYSTEM
                                                                             744
 8/79  SYSTEM
                                                                             744
 9/79  SYSTEM
                                                                             720
      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79          END DATE  9/79
                        FAN HOUSING WORK (CHANGING FROM LINED CARBON STEEL TO INCOLLOY 825) IS
                        CONTINUING.

            START DATE  7/79          END DATE  9/79
                        NEW PH MONITOR MODIFICATIONS HAVE YIELDED PROMISING RESULTS WITH RESPECT
                        TO MONITOR AVAILABILITY.

            START DATE  7/79          END DATE  9/79
                        THE FGD SYSTEM ATTRIBUTED 17.4% OF THE TOTAL UNIT UNAVAILABILITY FOR 1979
                        TO DATE.  THE BREAKDOWN IS AS FOLLOWS:
                             7.6% SCRUBBER ID FAN WORK/PROBLEMS
                             8.3% GENERAL SCRUBBER PROBLEMS AND MAINTENANCE
                             1.0% REAGENT HANDLING PROBLEMS (LIME SLAKER AND PIPING)
                             0.5% MIST ELIMINATOR PLUGGING
```

```
                                    SECTION 3
                    DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------------

 COMPANY NAME                                    PENNSYLVANIA POWER
 PLANT NAME                                      BRUCE MANSFIELD
 UNIT NUMBER                                     2
 CITY                                            SHIPPINGPORT
 STATE                                           PENNSYLVANIA
 GROSS UNIT GENERATING CAPACITY - MW               917.0
 NET UNIT GENERATING CAPACITY W/FGD - MW           825.0
 EQUIVALENT SCRUBBED CAPACITY - MW                 917.0

 ** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                    26749.       ( 11500 BTU/LB)
    AVERAGE ASH CONTENT - %                          12.90
    AVERAGE MOISTURE CONTENT - %                      7.00
    AVERAGE SULFUR CONTENT - %                        3.00
    AVERAGE CHLORIDE CONTENT - %                 ********

 ** FGD SYSTEM
    GENERAL PROCESS TYPE                         WET SCRUBBING
    PROCESS TYPE                                 LIME
    SYSTEM SUPPLIER                              CHEMICO
    NEW/RETROFIT                                 NEW
    ENERGY CONSUMPTION - %                           6.0
    INITIAL START-UP DATE                         7/77
    COMMERCIAL START-UP DATE                     **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %               92.10
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.80
    ABSORBER SPARE CAPACITY INDEX - %                 .0
    ABSORBER SPARE COMPONENTS INDEX                   .0

 ** WATER LOOP
    TYPE                                         OPEN
    FRESH MAKE-UP WATER - LITER/S                *******       (***** GPM)

 ** TREATMENT
    TYPE                                         CALCILOX

 ** DISPOSAL
    TYPE                                         LANDFILL


-----------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM
                                                                            672
 3/79  SYSTEM
                                                                            744
 4/79  SYSTEM
                                                                            720
      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  1/79        END DATE  4/79
                       NO INFORMATION WAS REPORTED FOR THIS PERIOD BY THE UTILITY.

 5/79  SYSTEM
                                                                            744
 6/79  SYSTEM      68.8       100.0
                                                                           4344
      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  1/79        END DATE  6/79
                       THE ABOVE AVAILABILITY IS THE AVAILABILITY FOR JANUARY 1, 1979 THROUGH
                       MAY 31, 1979.

           START DATE  1/79        END DATE  6/79
```

```
PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)



----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                   THE UTILITY REPORTED THAT SOME FAN PROBLEMS WERE RECENTLY ENCOUNTERED.
 7/79  SYSTEM

 8/79  SYSTEM                                                               744

 9/79  SYSTEM                                                               744

       ** PROBLEMS/SOLUTIONS/COMMENTS                                       720

            START DATE  7/79         END DATE  9/79
                        CHIMNEY LINING WORK (APPLICATION OF CXL 2000) WAS COMPLETED IN EARLY 1979.
            START DATE  7/79         END DATE  9/79
                        FAN HOUSING WORK (CHANGING FROM LINED CARBON STEEL TO INCOLLOY 825) IS
                        CONTINUING.
            START DATE  7/79         END DATE  9/79
                        NEW PH MONITOR MODIFICATIONS HAVE YIELDED PROMISING RESULTS WITH RESPECT
                        TO MONITOR AVAILABILITY.
            START DATE  7/79         END DATE  9/79
                        THE FGD SYSTEM ATTRIBUTED 10.8% OF THE TOTAL UNIT UNAVAILABILITY FOR 1979
                        TO DATE.  THE BREAKDOWN IS AS FOLLOWS:
                             5.0% CHIMNEY (FINISHED CXL 2000 APPLICATION)
                             1.3% GENERAL SCRUBBER PROBLEMS AND MAINTENANCE
                             1.5% ID FAN WORK/PROBLEMS
                             2.0% MIST ELIMINATOR PLUGGING
                             1.0% EMISSION VIOLATION (CUT BACK OF BOILER LOAD BECAUSE OF LOW SO2
                                  REMOVAL EFFICIENCY)
```

```
                                        SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-------------------------------------------------------------------------------------------------------
 COMPANY NAME                                        PHILADELPHIA ELECTRIC
 PLANT NAME                                          EDDYSTONE
 UNIT NUMBER                                         1A
 CITY                                                EDDYSTONE
 STATE                                               PENNSYLVANIA
 GROSS UNIT GENERATING CAPACITY - MW                   120.0
 NET UNIT GENERATING CAPACITY W/FGD - MW               120.0
 EQUIVALENT SCRUBBED CAPACITY - MW                     120.0

 ** FUEL DATA
     FUEL TYPE                                       COAL
     FUEL GRADE                                      BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                       31634.        ( 13600 BTU/LB)
     AVERAGE ASH CONTENT - %                              9.40
     AVERAGE MOISTURE CONTENT - %                         5.90
     AVERAGE SULFUR CONTENT - %                           2.60
     AVERAGE CHLORIDE CONTENT - %                    ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                            WET SCRUBBING
     PROCESS TYPE                                    MAGNESIUM OXIDE
     SYSTEM SUPPLIER                                 UNITED ENGINEERS
     NEW/RETROFIT                                    RETROFIT
     ENERGY CONSUMPTION - %                          *******
     INITIAL START-UP DATE                            9/75
     COMMERCIAL START-UP DATE                         9/75
     SO2 DESIGN REMOVAL EFFICIENCY - %                  90.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.00
     ABSORBER SPARE CAPACITY INDEX - %                    .0
     ABSORBER SPARE COMPONENTS INDEX                      .0

 ** WATER LOOP
     TYPE                                            OPEN
     FRESH MAKE-UP WATER - LITER/S                       8.3        (  132 GPM)

 ** BYPRODUCT
     BYPRODUCT NATURE                                SULFURIC ACID
     DISPOSITION


---------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
 2/79  SYSTEM
                                                                            672
 3/79  SYSTEM
                                                                            744
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  3/79
                        NO INFORMATION WAS REPORTED FOR THIS REPORT PERIOD.

 4/79  SYSTEM
                                                                            720
 5/79  SYSTEM
                                                                            744
 6/79  SYSTEM
                                                                            720
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  6/79        END DATE  6/79
                        NO INFORMATION IS AVAILABLE FOR THIS PERIOD BUT SHOULD BE FOR THE NEXT
                        REPORT PERIOD.

 7/79  SYSTEM
                                                                            744
 8/79  SYSTEM
                                                                            744
```

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79

NO DATA WAS AVAILABLE FOR THE UNIT DURING THE THIRD QUARTER 1979.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	PUBLIC SERVICE OF NEW MEXICO	
PLANT NAME	SAN JUAN	
UNIT NUMBER	1	
CITY	WATERFLOW	
STATE	NEW MEXICO	
GROSS UNIT GENERATING CAPACITY - MW	361.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	314.0	
EQUIVALENT SCRUBBED CAPACITY - MW	361.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	18841.	(8100 BTU/LB)
AVERAGE ASH CONTENT - %	22.45	
AVERAGE MOISTURE CONTENT - %	14.82	
AVERAGE SULFUR CONTENT - %	.80	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY POWERGAS	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	4.4	
INITIAL START-UP DATE	4/78	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
ABSORBER SPARE CAPACITY INDEX - %	33.0	
ABSORBER SPARE COMPONENTS INDEX	1.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	30.2	(480 GPM)
** BYPRODUCT		
BYPRODUCT NATURE	ELEMENTAL SULFUR	
DISPOSITION	MARKETED	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 1/79 END DATE 5/79
HOURS ARE NOT YET AVAILABLE BECAUSE THE UTILITY IS CONCENTRATING EFFORTS ON OPERATION OF THIS NEW UNIT. THE UTILITY REPORTED THAT THE SCRUBBING MODULES THEMSELVES ARE OPERATING FINE. ALSO THE CHEMICAL PLANT IS READY AND THERE IS NO SYSTEM PLUGGING WHATSOEVER.

START DATE 1/79 END DATE 5/79
THE MAJOR PROBLEM ENCOUNTERED WAS GYRATING FANS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

PERFORMANCE DATA											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79

DURING THE THIRD QUARTER THE UNIT OPERATED ON TWO ABSORBERS. ALL FOUR ABSORBERS HAVE BEEN LARGELY AVAILABLE. ONE ABSORBER WAS DOWN DUE TO BOOSTER BLOWER VIBRATION PROBLEMS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	PUBLIC SERVICE OF NEW MEXICO	
PLANT NAME	SAN JUAN	
UNIT NUMBER	2	
CITY	WATERFLOW	
STATE	NEW MEXICO	
GROSS UNIT GENERATING CAPACITY - MW	350.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	306.0	
EQUIVALENT SCRUBBED CAPACITY - MW	350.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	20934.	(9000 BTU/LB)
AVERAGE ASH CONTENT - %	22.45	
AVERAGE MOISTURE CONTENT - %	14.82	
AVERAGE SULFUR CONTENT - %	.80	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY POWERGAS	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	4.6	
INITIAL START-UP DATE	8/78	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
ABSORBER SPARE CAPACITY INDEX - %	33.0	
ABSORBER SPARE COMPONENTS INDEX	1.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** BYPRODUCT		
BYPRODUCT NATURE	ELEMENTAL SULFUR	
DISPOSITION	MARKETED	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 1/79 END DATE 5/79
HOURS ARE NOT YET AVAILABLE BECAUSE THE UTILITY IS CONCENTRATING EFFORTS ON OPERATION OF THIS NEW UNIT. THE UTILITY REPORTED THAT THE SCRUBBING MODULES THEMSELVES ARE OPERATING FINE. ALSO THE CHEMICAL PLANT IS READY AND THERE IS NO SYSTEM PLUGGING WHATSOEVER.

START DATE 1/79 END DATE 5/79
THE MAJOR PROBLEM ENCOUNTERED WAS GYRATING FANS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.)

```
----------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                               ----- ----- ----- ------ ----- ------
      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  9/79
                        DURING THE THIRD QUARTER TWO OF THE FOUR ABSORBERS WERE DOWN DUE TO
                        BOOSTER BLOWER VIBRATION PROBLEMS.
```

```
                                         SECTION 3
                      DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------------------------

  COMPANY NAME                                       SOUTH CAROLINA PUBLIC SERVICE
  PLANT NAME                                         WINYAH
  UNIT NUMBER                                        2
  CITY                                               GEORGETOWN
  STATE                                              SOUTH CAROLINA
  GROSS UNIT GENERATING CAPACITY - MW                  280.0
  NET UNIT GENERATING CAPACITY W/FGD - MW              258.0
  EQUIVALENT SCRUBBED CAPACITY - MW                    140.0

** FUEL DATA
     FUEL TYPE                                       COAL
     FUEL GRADE                                      BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                       26749.         ( 11500 BTU/LB)
     AVERAGE ASH CONTENT - %                            13.50
     AVERAGE MOISTURE CONTENT - %                    ********
     AVERAGE SULFUR CONTENT - %                          1.70
     AVERAGE CHLORIDE CONTENT - %                    ********

** FGD SYSTEM
     GENERAL PROCESS TYPE                            WET SCRUBBING
     PROCESS TYPE                                    LIMESTONE
     SYSTEM SUPPLIER                                 BABCOCK & WILCOX
     NEW/RETROFIT                                    NEW
     ENERGY CONSUMPTION - %                              1.1
     INITIAL START-UP DATE                            7/77
     COMMERCIAL START-UP DATE                        **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                  69.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.40
     ABSORBER SPARE CAPACITY INDEX - %                    .0
     ABSORBER SPARE COMPONENTS INDEX                      .0

** WATER LOOP
     TYPE                                            OPEN
     FRESH MAKE-UP WATER - LITER/S                      6.3         (  100 GPM)

** DISPOSAL
     TYPE                                            POND


-------------------------------------------PERFORMANCE DATA------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                 672

 3/79  SYSTEM     96.6        96.4        96.4        92.7                   1416  1361   1313

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  3/79
                        AN OUTAGE WAS REQUIRED TO RENEW QUENCHER PUMP BELTS AND FOR REPAIRS TO A
                        QUENCHER SUCTION VALVE.

            START DATE  2/79        END DATE  3/79
                        OUTAGES WERE REQUIRED TO REPAIR A HOLE IN THE FEED SLURRY LINE, TO INSPECT
                        THE MODULE FOR PLUGGAGE, AND BECAUSE OF A BOOSTER FAN TRIP.

            START DATE  2/79        END DATE  3/79
                        THE OPERATING VALUES SHOWN ARE THE FIGURES FOR FEB. AND MARCH COMBINED.

 4/79  SYSTEM     99.4        99.4        99.4        99.4                    720   720    716  73.4

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79        END DATE  4/79
                        THE UTILITY REPORTED THAT THE SO2 MONITOR HAS PASSED THE STATE CERTIFICA-
                        TION TEST BUT REQUIRES CONTINUING MAINTENANCE TO KEEP IT OPERATING.
```

```
------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

                    START DATE  4/79         END DATE  4/79
                                A MALFUNCTION OF THE RECIRCULATION TANK LEVEL INDICATOR RESULTED IN A LOW
                                LIQUID LEVEL WHICH RESULTED IN A FORCED OUTAGE.

 5/79  SYSTEM       98.4         98.7        100.0        95.6                    744   721    711  82.0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                    START DATE  5/79         END DATE  5/79
                                THE UTILITY REPORTED THAT THE SO2 MONITOR SAMPLE PUMP REQUIRES MAINTENANCE
                                ALMOST EVERY 24 HOURS.

                    START DATE  5/79         END DATE  5/79
                                A BOILER OUTAGE ALLOWED TIME FOR CLEANING ABSORBER TRAYS, UNPLUGGING FOUR
                                NOZZLES, CLEANING THE SUMP BOTTOM, AND REPAIRING A SPRAY WASH VALVE.

 6/79  SYSTEM       92.4         92.3         92.1        91.6   80.00            720   716    660  86.6

       ** PROBLEMS/SOLUTIONS/COMMENTS

                    START DATE  6/79         END DATE  6/79
                                FOUR OUTAGES IN JUNE WERE DUE TO PLUGGED ABSORBER NOZZLES.  THE PRIMARY
                                CAUSE APPEARED TO BE THAT A SCREEN IN THE ABSORBER SIDE OF THE SUMP BOTTOM
                                WAS LEFT OUT DURING THE PREVIOUS OUTAGE.

                    START DATE  6/79         END DATE  6/79
                                A HEAVY SCALE BUILD-UP IN THE SUMP BELOW THE VENTURI WAS NOTED.

                    START DATE  6/79         END DATE  6/79
                                THE UTILITY REPORTED THAT MGO TESTING HAS BEGUN.

 7/79  SYSTEM       98.4         98.4         98.4        97.8   84.00            744   740    732

       ** PROBLEMS/SOLUTIONS/COMMENTS

                    START DATE  7/79         END DATE  7/79
                                THE ABSORBER WENT OFF-LINE DUE TO QUENCHER PUMP PACKING PROBLEMS.

                    START DATE  7/79         END DATE  7/79
                                SOME PLUGGING WAS ENCOUNTERED WITH ONE OF THE ABSORBER NOZZLES.

                    START DATE  7/79         END DATE  7/79
                                SOME OUTAGE TIME WAS NEEDED TO INSTALL A QUENCHER WALL WASH NOZZLE.

 8/79  SYSTEM       99.4         99.0         99.4        98.1   80.00            744   738    739

       ** PROBLEMS/SOLUTIONS/COMMENTS

                    START DATE  8/79         END DATE  8/79
                                A 4 HOUR OUTAGE WAS THE RESULT OF BOOSTER FAN CONTROL PROBLEMS.

                    START DATE  8/79         END DATE  8/79
                                A NEW PORT FOR THE SCRUBBER OUTLET GAS SAMPLE PROBE HAD TO BE INSTALLED.
                                THIS TOOK 1 HOUR OF SCHEDULED DOWN TIME.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
------------------------------------------------------------------------------------------------------------
 COMPANY NAME                                          SOUTH MISSISSIPPI ELEC PWR
 PLANT NAME                                            R.D. MORROW
 UNIT NUMBER                                           1
 CITY                                                  HATTISBURG
 STATE                                                 MISSISSIPPI
 GROSS UNIT GENERATING CAPACITY - MW                     200.0
 NET UNIT GENERATING CAPACITY W/FGD - MW                 180.0
 EQUIVALENT SCRUBBED CAPACITY - MW                       124.0

 ** FUEL DATA
     FUEL TYPE                                         COAL
     FUEL GRADE                                        ******
     AVERAGE HEAT CONTENT - J/G                         27912.        ( 12000 BTU/LB)
     AVERAGE ASH CONTENT - %                                8.00
     AVERAGE MOISTURE CONTENT - %                           6.50
     AVERAGE SULFUR CONTENT - %                             1.30
     AVERAGE CHLORIDE CONTENT - %                      ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                              WET SCRUBBING
     PROCESS TYPE                                      LIMESTONE
     SYSTEM SUPPLIER                                   RILEY STOKER/ENVIRONEERING
     NEW/RETROFIT                                      NEW
     ENERGY CONSUMPTION - %                               5.5
     INITIAL START-UP DATE                              8/78
     COMMERCIAL START-UP DATE                          **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                    85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %            99.60
     ABSORBER SPARE CAPACITY INDEX - %                      .0
     ABSORBER SPARE COMPONENTS INDEX                        .0

 ** WATER LOOP
     TYPE                                              CLOSED
     FRESH MAKE-UP WATER - LITER/S                     *******        (***** GPM)

 ** TREATMENT
     TYPE                                              FLYASH STABILIZED

 ** DISPOSAL
     TYPE                                              LANDFILL

-----------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS  FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ -----  ------

 2/79  SYSTEM
                                                                           672

 3/79  SYSTEM
                                                                           744

 4/79  SYSTEM
                                                                           720   631

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79         END DATE  4/79
                        THE BOILER RETURNED TO SERVICE ON APRIL 1 AFTER COMPLETION OF REPAIRS
                        TO THE BOILER TUBES.

            START DATE  4/79         END DATE  4/79
                        NO FGD SYSTEM RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR APRIL.

 5/79  SYSTEM
                                                                           744

 6/79  SYSTEM
                                                                           720
```

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW 1 (CONT.)

```
------------------------------------------PERFORMANCE DATA------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
         ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  5/79        END DATE  6/79
                           THE UTILITY REPORTED THAT THE SYSTEM OPERATED MOST OF MAY AND JUNE WITH
                           NO MAJOR PROBLEMS.
 7/79  SYSTEM
                                                                            744
         ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  7/79        END DATE  7/79
                           DURING THE FIRST WEEK OF JULY THE UNIT WAS REMOVED FROM SERVICE DUE TO
                           SEVERE PROBLEMS WITH THE FGD SYSTEM.  THE UTILITY NOTED THAT ABOUT HALF
                           OF THE MODULE HEADERS WERE PLUGGED, HOLES WERE NOTED IN THE MODULE SHELL,
                           THE UPPER ROD BANK CORRODED AWAY FROM THE SHELL, AND EXTENSIVE PLUGGING
                           OF THE MIST ELIMINATOR OCCURRED.  LINER FAILURE AT THE OUTLET DUCTWORK WAS
                           ALSO EXPERIENCED.  THE UTILITY PLANS TO REPLACE THE DUCTWORK WITH
                           HASTALLOY.  THE FGD SYSTEM IS EXPECTED TO BE OFF LINE FOR SEVERAL MONTHS
                           FOR REPAIRS TO BE COMPLETED.
 8/79  SYSTEM
                                                                            744     0
 9/79  SYSTEM
                                                                            720     0
         ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  8/79        END DATE  9/79
                           THE UNIT REMAINED OFF LINE DURING THE MONTHS OF AUGUST AND SEPTEMBER AS
                           MAINTENANCE AND REPAIR WORK CONTINUED.
```

```
                                                     SECTION 3
                              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
----------------------------------------------------------------------------------------------------------------

 COMPANY NAME                                    SOUTH MISSISSIPPI ELEC PWR
 PLANT NAME                                      R.D. MORROW
 UNIT NUMBER                                     2
 CITY                                            HATTISBURG
 STATE                                           MISSISSIPPI
 REGULATORY CLASSIFICATION                       A
 PARTICULATE EMISSION LIMITATION - NG/J          ******          (****** LB/MMBTU)
 SO2 EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
 NET PLANT GENERATING CAPACITY - MW                40.0
 GROSS UNIT GENERATING CAPACITY - MW              200.0
 NET UNIT GENERATING CAPACITY W/FGD - MW          180.0
 NET UNIT GENERATING CAPACITY WO/FGD - MW         191.0
 EQUIVALENT SCRUBBED CAPACITY - MW                124.0

 ** BOILER DATA
     SUPPLIER                                    RILEY STOKER
     TYPE                                        PULVERIZED COAL
     SERVICE LOAD                                BASE
     COMMERCIAL SERVICE DATE                     **/**
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       ********        (******* ACFM)
     FLUE GAS TEMPERATURE - C                      132.2         ( 270 F)
     STACK HEIGHT - M                              124.          ( 408 FT)
     STACK TOP DIAMETER - M                      *******         (***** FT)

 ** FUEL DATA
     FUEL TYPE                                   COAL
     FUEL GRADE                                  ******
     AVERAGE HEAT CONTENT - J/G                   27912.         ( 12000 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                   ******
     AVERAGE ASH CONTENT - %                          8.00
     RANGE ASH CONTENT - %                       ******
     AVERAGE MOISTURE CONTENT - %                     6.50
     RANGE MOISTURE CONTENT - %                  6 - 7
     AVERAGE SULFUR CONTENT - %                       1.30
     RANGE SULFUR CONTENT - %                    1 - 1.75
     AVERAGE CHLORIDE CONTENT - %                ********
     RANGE CHLORIDE CONTENT - %                  ******

 ** ESP
     NUMBER                                      1
     TYPE                                        HOT SIDE
     SUPPLIER                                    BUELL
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.6

 ** FGD SYSTEM
     SALEABLE PRODUCT/THROWAWAY PRODUCT          THROWAWAY PRODUCT
     GENERAL PROCESS TYPE                        WET SCRUBBING
     PROCESS TYPE                                LIMESTONE
     PROCESS ADDITIVES                           NONE
     SYSTEM SUPPLIER                             RILEY STOKER/ENVIRONEERING
     A-E FIRM                                    BURNS & MCDONNELL
     CONSTRUCTION FIRM                           RILEY STOKER
     DEVELOPMENT LEVEL                           FULL SCALE
     NEW/RETROFIT                                NEW
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.60
     SO2 DESIGN REMOVAL EFFICIENCY - %              85.00
     INITIAL START-UP                             6/79

 ** ABSORBER
     NUMBER                                      1
     TYPE                                        ROD DECK SCRUBBER
     INITIAL START UP                             6/79
     SUPPLIER                                    RILEY STOKER/ENVIRONEERING
     NUMBER OF STAGES                                7
     DIMENSIONS - FT                             10 X 40 X 10
     SHELL MATERIAL                              CAPBON STEEL
     SHELL LINER MATERIAL                        DUDICK FLAKEGLASS
     INTERNAL MATERIAL                           316L SS RODS, HASTELLOY G SUPPORTS
     GAS FLOW - CU.M/S                             192.03        ( 406940 ACFM)
     GAS TEMPERATURE - C                           132.2         (  270 F)
```

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW 2 (CONT.)

** FANS	
TYPE	BOILER ID
** MIST ELIMINATOR	
TYPE	CHEVRON
CONSTRUCTION MATERIAL	FRP
CONFIGURATION	VERTICAL
NUMBER OF STAGES	3
WASH SYSTEM	CONTINUOUS WASH
** REHEATER	
TYPE	BYPASS
** THICKENER	
NUMBER	1
DIAMETER - M	12.2 (40 FT)
** WATER LOOP	
TYPE	CLOSED
** TREATMENT	
TYPE	FLYASH STABILIZED
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
TRANSPORTATION	TRUCK

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 6/79 END DATE 6/79
R.D. MORROW UNIT #2 BEGAN OPERATION IN THE LATTER PART OF JUNE. OPERATIONAL DATA ARE NOT YET AVAILABLE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 8/79
NO INFORMATION WAS AVAILABLE FOR THE JULY-AUGUST 1979 PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM	4.7	5.0	5.0	4.7			720	34	58	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 9/79 END DATE 9/79
DURING SEPTEMBER THE UNIT WAS TAKEN OFF LINE DUE TO FAILURE OF LINERS AND PLUGGING IN THE MIST ELIMINATOR SECTIONS.

```
                                        SECTION 3
                     DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------------

 COMPANY NAME                                   SOUTHERN ILLINOIS POWER COOP
 PLANT NAME                                     MARION
 UNIT NUMBER                                    4
 CITY                                           MARION
 STATE                                          ILLINOIS
 REGULATORY CLASSIFICATION                      A
 PARTICULATE EMISSION LIMITATION - NG/J         ******          (****** LP/MMBTU)
 SO2 EMISSION LIMITATION - NG/J                 ******          (****** LB/MMBTU)
 NET PLANT GENERATING CAPACITY - MW               270.0
 GROSS UNIT GENERATING CAPACITY - MW              184.0
 NET UNIT GENERATING CAPACITY W/FGD - MW          160.0
 NET UNIT GENERATING CAPACITY WO/FGD - MW       *******
 EQUIVALENT SCRUBBED CAPACITY - MW                184.0

 ** BOILER DATA
     SUPPLIER                                   BABCOCK & WILCOX
     TYPE                                       ******
     SERVICE LOAD                               BASE
     COMMERCIAL SERVICE DATE                    10/78
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S      ********        (******* ACFM)
     FLUE GAS TEMPERATURE - C                   *******         (**** F)
     STACK HEIGHT - M                           ******          (**** FT)
     STACK TOP DIAMETER - M                     *******         (***** FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 ******
     AVERAGE HEAT CONTENT - J/G                  20934.         (  9000 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                 ******
     AVERAGE ASH CONTENT - %                        16.00
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %                   10.00
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                      3.50
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %                     .10
     RANGE CHLORIDE CONTENT - %                 ******

 ** ESP
     NUMBER                                      1
     SUPPLIER                                   BABCOCK & WILCOX
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     99.6
     FLUE GAS CAPACITY - CU.M/S                   285.5         ( 605000 ACFM)
     FLUE GAS TEMPERATURE - C                     143.3         (  290 F)
     PRESSURE DROP - KPA                        *******         (***** IN-H2O)

 ** FGD SYSTEM
     SALEABLE PRODUCT/THROWAWAY PRODUCT         THROWAWAY PRODUCT
     GENERAL PROCESS TYPE                       WET SCRUBBING
     PROCESS TYPE                               LIMESTONE
     SYSTEM SUPPLIER                            BABCOCK & WILCOX
     A-E FIRM                                   BURNS & MCDONNELL
     CONSTRUCTION FIRM                          BABCOCK & WILCOX
     DEVELOPMENT LEVEL                          FULL SCALE
     NEW/RETROFIT                               NEW
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     99.60
     SO2 DESIGN REMOVAL EFFICIENCY - %             89.40
     INITIAL START-UP                            5/79
     ABSORBER SPARE CAPACITY INDEX - %          *******
     ABSORBER SPARE COMPONENT INDEX             *******

 ** ABSORBER
     NUMBER                                      2
     TYPE                                       SPRAY TOWER
     INITIAL START UP                           10/78
     SUPPLIER                                   BABCOCK & WILCOX
     PRESSURE DROP - KPA                            3.0         (12.2 IN-H2O)
     SO2 DESIGN REMOVAL EFFICIENCY - %             86.7

 ** PROCESS CONTROL CHEMISTRY
     CONTROL VARIABLES                          PH
     CONTROL RANGE                              5-6
```

SOUTHERN ILLINOIS POWER COOP: MARION 4 (CONT.)

** REHEATER
TYPE NONE

** WATER LOOP
TYPE OPEN

** TREATMENT
TYPE FLYASH STABILIZED

** DISPOSAL
NATURE FINAL
TYPE LANDFILL

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 6/79
THE UTILITY REPORTED THAT THE UNIT BEGAN OPERATION IN MAY. HOWEVER THE UNIT IS NOW DOWN AND SUFFERED TWO PREVIOUS OUTAGES. THE PREVIOUS OUTAGES WERE DUE TO CENTRIFUGE AND THICKENER PROBLEMS. THE PRESENT OUTAGE IS DUE TO BEARING FAILURES ON THE PUG MILL AND IMPROPER FIT OF THE SLUDGE CONVEYING BELT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79
DURING THE THIRD QUARTER A ROUTINE INSPECTION OF THE SCRUBBER INTERNALS SHOWED NO SCALE FORMATION.

START DATE 7/79 END DATE 9/79
THE UTILITY REPORTED THAT THE FGD SYSTEM HAS ACHIEVED A 0.7 LB/MMBTU OF SO2 EMISSION LEVEL. THE UNIT IS SUBJECT TO THE 1.2 LB/MMBTU SO2 EMISSION STANDARD.

START DATE 7/79 END DATE 9/79
THE CONTINUOUS MONITORS HAVE NOT BEEN OPERATING ACCEPTABLY.

START DATE 7/79 END DATE 9/79
A TURBINE OVERHAUL/INSPECTION IS SCHEDULED FOR OCTOBER 1, 1979.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
-----------------------------------------------------------------------------------------------------
COMPANY NAME
PLANT NAME                                           SOUTHERN INDIANA GAS & ELEC
UNIT NUMBER                                          A.B. BROWN
CITY                                                 1
STATE                                                WEST FRANKLIN
REGULATORY CLASSIFICATION                            INDIANA
PARTICULATE EMISSION LIMITATION - NG/J               A
SO2 EMISSION LIMITATION - NG/J                         43.          (  .100 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                    516.          ( 1.200 LB/MMBTU)
GROSS UNIT GENERATING CAPACITY - MW                   250.0
NET UNIT GENERATING CAPACITY W/FGD - MW               265.0
NET UNIT GENERATING CAPACITY WO/FGD - MW              250.0
EQUIVALENT SCRUBBED CAPACITY - MW                     252.0
                                                      265.0
** BOILER DATA
    SUPPLIER
    TYPE                                             BABCOCK & WILCOX
    SERVICE LOAD                                     PULVERIZED COAL
    COMMERCIAL SERVICE DATE                          BASE
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S             0/79
    FLUE GAS TEMPERATURE - C                           372.82         ( 790036 ACFM)
    STACK HEIGHT - M                                   143.3          ( 290 F)
    STACK TOP DIAMETER - M                             152.           ( 498 FT)
                                                         4.4          ( 14.5 FT)
** FUEL DATA
    FUEL TYPE
    FUEL GRADE                                       COAL
    AVERAGE HEAT CONTENT - J/G                       ******
    RANGE HEAT CONTENT - BTU/LB                       30261.          ( 13010 BTU/LB)
    AVERAGE ASH CONTENT - %                                            ******
    RANGE ASH CONTENT - %                                8.80
    AVERAGE MOISTURE CONTENT - %                     ******
    RANGE MOISTURE CONTENT - %                          11.40
    AVERAGE SULFUR CONTENT - %                       ******
    RANGE SULFUR CONTENT - %                             4.50
    AVERAGE CHLORIDE CONTENT - %                     ******
    RANGE CHLORIDE CONTENT - %                            .05
                                                     ******
** ESP
    NUMBER
    TYPE                                             1
    SUPPLIER                                         COLD SIDE
                                                     BUELL
** FGD SYSTEM
    SALEABLE PRODUCT/THROWAWAY PRODUCT
    GENERAL PROCESS TYPE                             THROWAWAY PRODUCT
    PROCESS TYPE                                     WET SCRUBBING
    SYSTEM SUPPLIER                                  DUAL ALKALI
    A-E FIRM                                         FMC CORPORATION
    CONSTRUCTION FIRM                                BROWN & ROOT
    DEVELOPMENT LEVEL                                MID VALLEY
    NEW/RETROFIT                                     FULL SCALE
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        NEW
    SO2 DESIGN REMOVAL EFFICIENCY - %                   99.50
    INITIAL START-UP                                    85.00
    CONSTRUCTION INITIATION                           3/79
    CONTRACT AWARDED                                 10/77
    STARTED REQUESTING BIDS                          12/76
    ABSORBER SPARE CAPACITY INDEX - %                 4/76
    ABSORBER SPARE COMPONENT INDEX                      20.0
                                                          .3
** ABSORBER
    NUMBER
    TYPE                                             2
    INITIAL START UP                                 DISC CONTACTOR
    SUPPLIER                                          3/79
    NUMBER OF STAGES                                 FMC CORPORATION
    DIMENSIONS - FT                                     3
    SHELL MATERIAL                                   62 HIGH X 32 DIA.
    SHELL LINER MATERIAL                             CARBON STEEL
    INTERNAL MATERIAL                                CEILCOTE
    NUMBER OF NOZZLES                                HASTELLOY
                                                        1
```

```
SOUTHERN INDIANA GAS & ELEC: A.B. BROWN 1 (CONT.)

     NOZZLE TYPE
     BOILER LOAD/ABSORBER - %                       SINGLE PIPE
     GAS FLOW - CU.M/S                                 60.0
     GAS TEMPERATURE - C                              237.84       ( 504000 ACFM)
     SO2 INLET CONCENTRATION - PPM                    145.0        (  293 F)
     SO2 OUTLET CONTRATION - PPM                     2810
     SO2 DESIGN REMOVAL EFFICIENCY - %                520
                                                       65.0
  ** CENTRIFUGE
     TYPE
                                                    NONE

  ** FANS
     NUMBER
     TYPE                                             2
     SERVICE - WET/DRY                              BOOSTER
     CAPACITY - CU.M/S                              DRY
                                                      117.97      ( 250000 ACFM)
  ** VACUUM FILTER
     NUMBER
     TYPE                                             3
     CONSTRUCTION MATERIAL                          ROTARY DRUM
     CAPACITY - M T/D                               NYLON BELT
     OUTLET SOLIDS - %                               174.1        (  192 T/D)
                                                      60.0
  ** MIST ELIMINATOR
     NUMBER
     TYPE                                             2
     NUMBER OF STAGES                               CHEVRON
     WASH SYSTEM                                       2
                                                    OCCASIONAL

  ** PROCESS CONTROL CHEMISTRY

  ** PUMPS
     SERVICE
     -------                                        NUMBER
     RECYCLE                                        ------
                                                      2
  ** TANKS
     SERVICE
     -------                                        NUMBER
     REACTION                                       ------
     SURGE TANK                                     ****
                                                    ****
  ** REHEATER
     TYPE
                                                    NONE

  ** THICKENER
     NUMBER
     DIAMETER - M                                     1
                                                      30.5        (100 FT)
  ** WATER LOOP
     TYPE
                                                    CLOSED

  ** REAGENT PREPARATION EQUIPMENT
     NUMBER OF SLAKERS
                                                      3

  ** DISPOSAL
     NATURE
     TYPE                                           FINAL
     LOCATION                                       LANDFILL
     TRANSPORTATION                                 ON-SITE
                                                    TRUCK


---------------------------------------PERFORMANCE DATA-------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 3/79  SYSTEM
                                                                            744
 4/79  SYSTEM

                                                                            720
```

```
-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  3/79        END DATE  4/79
                        THE FGD SYSTEM BEGAN OPERATIONS ON MARCH 18, 1979.  NO OPERATIONAL DATA
                        ARE YET AVAILABLE.

 5/79  SYSTEM
                                                                            744
 6/79  SYSTEM
                                                                            720
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  6/79
                        OPERATING HOURS ARE NOT YET AVAILABLE.  HOWEVER THE UNIT HAS BEEN RUNNING
                        INTERMITTENTLY AS A RESULT OF PUMP LINER AND FRP PIPING DESIGN PROBLEMS.

 7/79  SYSTEM                   63.0                    55.0                744   650    408

 8/79  SYSTEM                   94.0                    94.0                744   743    701

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  8/79        END DATE  8/79
                        IN AUGUST THE FGD SYSTEM WAS FORCED OFF LINE FOR 43 HOURS DUE TO PROBLEMS
                        WITH THE RECYCLE PUMP IMPELLERS.

 9/79  SYSTEM                   75.0                    74.0                720   716    534

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  9/79        END DATE  9/79
                        THE ONLY FORCED OUTAGE DURING THE MONTH BEGAN ON SEPTEMBER 28 AND LASTED
                        THROUGH THE END OF THE MONTH.  THIS OUTAGE WAS DUE TO PROBLEMS WITH THE
                        VACUUM FILTERS AS WELL AS CHEMICAL PROBLEMS.

            START DATE  9/79        END DATE  9/79
                        IN SEPTEMBER 52 HOURS OF SCHEDULED OUTAGE WERE USED TO INSTALL A WATER
                        FILTER.  THE SCRUBBER WAS ALSO TAKEN OFF LINE FOR 72 HOURS FOR PRECIPITATOR
                        TESTING.  THE ONLY FORCED OUTAGE DURING THE MONTH BEGAN ON SEPTEMBER 28 AND
                        LASTED THROUGH THE END OF THE MONTH AS A RESULT OF POOR FILTER CAKE
                        QUALITY.  THIS HAS RESULTED FROM PROBLEMS WITH THE VACUUM FILTERS AS WELL
                        AS CHEMICAL PROBLEMS.
```

```
-------------------------------------------------------------------------------------------------------------------
COMPANY NAME                                          SPRINGFIELD CITY UTILITIES
PLANT NAME                                            SOUTHWEST
UNIT NUMBER                                           1
CITY                                                  SPRINGFIELD
STATE                                                 MISSOURI
GROSS UNIT GENERATING CAPACITY - MW                     194.0
NET UNIT GENERATING CAPACITY W/FGD - MW                 173.0
EQUIVALENT SCRUBBED CAPACITY - MW                       194.0

** FUEL DATA
     FUEL TYPE                                        COAL
     FUEL GRADE                                       BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                        29075.         ( 12500 BTU/LB)
     AVERAGE ASH CONTENT - %                             13.00
     AVERAGE MOISTURE CONTENT - %                     ********
     AVERAGE SULFUR CONTENT - %                           3.50
     AVERAGE CHLORIDE CONTENT - %                          .30

** FGD SYSTEM
     GENERAL PROCESS TYPE                             WET SCRUBBING
     PROCESS TYPE                                     LIMESTONE
     SYSTEM SUPPLIER                                  AIR CORRECTION DIVISION, UOP
     NEW/RETROFIT                                     NEW
     ENERGY CONSUMPTION - %                               4.6
     INITIAL START-UP DATE                             4/77
     COMMERCIAL START-UP DATE                          **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                   80.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %           99.70
     ABSORBER SPARE CAPACITY INDEX - %                     .0
     ABSORBER SPARE COMPONENTS INDEX                       .0

** WATER LOOP
     TYPE                                             CLOSED
     FRESH MAKE-UP WATER - LITER/S                       19.8         ( 315 GPM)

** TREATMENT
     TYPE                                             NONPROPRIETARY

** DISPOSAL
     TYPE                                             LANDFILL

---------------------------------------------PERFORMANCE DATA--------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER   FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS  HOURS  HOURS FACTOR
                                                                 ----- ----- ----- ------ ----- ------
 2/79  S-1        25.0          .0          .0          .0
       S-2        24.0        32.0        32.0        24.0
       SYSTEM     24.5        16.0        16.0        12.1                    672    508     81   71.4

    ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  2/79        END DATE  2/79
                      THE S-1 MODULE EXPERIENCED PLUGGING PROBLEMS IN THE FIRST AND SECOND
                      STAGE DURING FEBRUARY AND DID NOT OPERATE.  DUE TO FLUE GAS LEAKAGE INTO  H
                      THE MODULE ACCESS COULD NOT BE OBTAINED TO CLEAN THE MODULE.

          START DATE  2/79        END DATE  2/79
                      EXPANSION JOINT PROBLEMS AND BROKEN LINES WERE REPORTED.

          START DATE  2/79        END DATE  2/79
                      A LACK OF SCRUBBING MEDIUM DURING THE LATTER PART OF FEBRUARY WAS REPORTED
                      BY THE UTILITY.

          START DATE  2/79        END DATE  2/79
                      THE S-2 MODULE PROBLEMS INCLUDED FROZEN VALVES AND LINES.

 3/79  S-1        62.0        39.5        39.5        38.7
```

PERFORMANCE DATA											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	S-2	55.0	14.0	14.0	13.7						
	SYSTEM	58.5	26.8	26.8	26.2			744	730	195	52.8

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79
THE MAJORITY OF MODULE S-1 DOWNTIME WAS DUE TO A BROKEN SUPERNATE LINE AND MAKEUP CROSS TIE.

START DATE 3/79 END DATE 3/79
THE UTILITY REPORTED THAT THE MODULE WAS UNABLE TO RUN FOR A TIME DUE TO A DESIGN PROBLEM WITH A 500 HP MOTOR.

4/79	S-2	51.6	26.5	45.0	27.0						
	S-1	42.6	30.9	30.9	18.5						
	SYSTEM	47.1	37.9	50.4	22.8			720	432	164	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 4/79
MODULE S-1 EXPERIENCED AN EXPANSION JOINT FAILURE ON THE I.D. FAN DISCHARGE.

START DATE 4/79 END DATE 4/79
LOW DENSITY AT THE SLURRY HOLD TANK WAS A MAJOR PROBLEM.

START DATE 4/79 END DATE 4/79
SOME PLUGGING OF THE FIRST STAGE OF THE S-2 MODULE WAS REPORTED BY THE UTILITY.

5/79	S-1	84.1	77.5	77.5	67.0						
	S-2	.0	.0	.0	.0						
	SYSTEM	42.1	38.8	48.5	33.5			744	644	249	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 5/79
THE S-2 MODULE WAS NOT OPERATED DURING MAY DUE TO A BROKEN RECYCLE TANK AGITATOR SHAFT. A NEW ONE HAS BEEN ORDERED. RUBBER LINING OF THE SHAFT AND REPAIR OF DAMAGED LINING ON THE IMPELLER WILL BE DONE ON SITE.

6/79	S-1	55.0	53.0	54.2	52.9						
	S-2	.0	.0	.0	.0						
	SYSTEM	27.5	26.5	27.1	26.5			720	719	191	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 6/79 END DATE 6/79
THE BROKEN AGITATOR SHAFT WAS REPLACED AND LINED DURING JUNE.

START DATE 6/79 END DATE 6/79
THE S-2 MODULE WAS OUT OF SERVICE ON THREE OCCASIONS DUE TO PLUGGAGE OF THE FIRST AND SECOND STAGES. THE UTILITY REPORTED THAT WITH THE EXCEPTION OF THE PLUGGING PROBLEM ONLY A FEW MINOR SHORT DURATION TRIPS WERE NOTED.

7/79	S-1	59.2	34.1	34.1	34.1						
	S-2	55.3	47.4	47.4	47.3						
	SYSTEM	57.3	40.8	40.8	40.7			744	743	111	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 7/79
THE S-1 MODULE WAS NOT OPERATED DURING THE FIRST PART OF THE PERIOD DUE TO THE PLUGGAGE IN THE FIRST AND SECOND STAGES. TWO OTHER OUTAGES OCCURRED. ONE DUE TO A BROKEN LINE AND THE OTHER TIME IT WAS P.C. TROUBLE.

START DATE 7/79 END DATE 7/79
THE S-2 MODULE WAS NOT OPERATED FOR TWO PERIODS. ONCE WHEN THE TANK WAS BEING REFILLED AFTER AN AGITATOR WAS INSTALLED AND ONCE TO CLEAN THE FIRST AND SECOND STAGES.

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/79	S-1	74.5	53.8		50.7						
	S-2	94.6	70.9		66.8						
	SYSTEM	84.7	62.4	62.4	58.8			744	701	437	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 8/79 END DATE 8/79

THE S-1 MODULE WAS DOWN FOR TWO PERIODS DUE TO PLUGGING IN THE ABSORBER SECTION. THE MODULE ALSO TRIPPED OFF DUE TO LOSS OF SUPERNATE PUMPS. APART FROM THIS BOTH MODULES WERE EITHER AVAILABLE OR IN OPERATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	S-1	48.6	58.3	58.3	45.8						
	S-2	68.8	60.2	78.8	47.4						
	SYSTEM	71.3	59.3	65.7	46.6			720	566	336	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 9/79 END DATE 9/79

THE S-1 MODULE WAS OFF LINE DUE TO PLUGGING IN THE ABSORBER SECTION FOR TWO PERIODS AND IT ALSO TRIPPED DUE TO LOSS OF SUPERNATE PUMPS. APART FROM THIS IT WAS EITHER OPERATING OR AVAILABLE.

START DATE 9/79 END DATE 9/79

THE S-2 MODULE WAS OFF LINE ONCE DUE TO BROKEN SUPERNATE LINE, AND ONCE DUE TO BAD PH PROBES IN SEPTEMBER. IT WAS ALSO OFF LINE FOR SEVERAL SHORT PERIODS DUE TO NUISANCE TRIPS; HOWEVER, IT WAS EITHER ON LINE OR AVAILABLE THE REST OF THE PERIOD.

```
                                          SECTION 3
                        DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-------------------------------------------------------------------------------------------------------
 COMPANY NAME
 PLANT NAME                                             TENNESSEE VALLEY AUTHORITY
 UNIT NUMBER                                            SHAWNEE
 CITY                                                   10A
 STATE                                                  PADUCAH
 GROSS UNIT GENERATING CAPACITY - MW                    KENTUCKY
 NET UNIT GENERATING CAPACITY W/FGD - MW                   10.0
 EQUIVALENT SCRUBBED CAPACITY - MW                         10.0
                                                           10.0
 ** FUEL DATA
     FUEL TYPE
     FUEL GRADE                                         COAL
     AVERAGE HEAT CONTENT - J/G                         BITUMINOUS
     AVERAGE ASH CONTENT - %                            *******         (****** BTU/LB)
     AVERAGE MOISTURE CONTENT - %                       ********
     AVERAGE SULFUR CONTENT - %                         ********
     AVERAGE CHLORIDE CONTENT - %                           2.90
                                                        ********
 ** FGD SYSTEM
     GENERAL PROCESS TYPE
     PROCESS TYPE                                       WET SCRUBBING
     SYSTEM SUPPLIER                                    LIME/LIMESTONE
     NEW/RETROFIT                                       AIR CORRECTION DIVISION, UOP
     ENERGY CONSUMPTION - %                             RETROFIT
     INITIAL START-UP DATE                              *******
     COMMERCIAL START-UP DATE                            4/72
     SO2 DESIGN REMOVAL EFFICIENCY - %                  **/**
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          ********
     ABSORBER SPARE COMPONENTS INDEX                    ********
                                                            .0
 ** WATER LOOP
     TYPE
     FRESH MAKE-UP WATER - LITER/S                      CLOSED
                                                        *******         (***** GPM)

-------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
 0/79  SYSTEM

      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  0/72         END DATE  9/79
                        REFER TO THE PERFORMANCE UPDATE INFORMATION FOR SHAWNEE 10B.
```

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	SHAWNEE	
UNIT NUMBER	100	
CITY	PADUCAH	
STATE	KENTUCKY	
GROSS UNIT GENERATING CAPACITY - MW	10.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	10.0	
EQUIVALENT SCRUBBED CAPACITY - MW	10.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	*******	(****** BTU/LB)
AVERAGE ASH CONTENT - %	********	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	2.90	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME/LIMESTONE	
SYSTEM SUPPLIER	CHEMICO	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	4/72	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	********	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	********	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79

ONE TEST RUN WAS CONDUCTED ON EACH OF THE TWO SCRUBBER SYSTEMS IN EARLY FEBRUARY TO PROVIDE SAMPLES FOR LEVEL 1 BIOASSY TESTING BY LITTON BIONETICS CORPORATION UNDER CONTRACT WITH EPA. ACTUAL SAMPLING OF SLURRIES AND CONDENSATES FROM THE SCRUBBER AND OXIDATION TANK OFF-GASES WAS PERFORMED BY BATTELLE COLUMBUS LABORATORY. FOR THIS PURPOSE, THE TCA WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AS A BASE CASE, AND THE VENTURI/SPRAY TOWER WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AND WITH ADIPIC ACID ADDITIVE AND TWO-SCRUBBER-LOOP FORCED OXIDATION.

A SERIES OF TESTS WAS CONDUCTED ON THE VENTURI/SPRAY TOWER SYSTEM FROM MID-FEBRUARY THROUGH THE END OF MARCH TO SIMULATE THE PLANNED TVA WIDOWS CREEK UNIT 8 FULL-SCALE, TWO-SCRUBBER-LOOP FORCED-OXIDATION SCHEME. SPECIAL WIDOWS CREEK LIMESTONE (STONEMAN) AND COAL (PITTSBURGH MIDWAY) WERE USED AT SHAWNEE DURING THESE TESTS. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH UP TO 6.0 AND AN AIR STOICHIOMETRY AS LOW AS 1.5 ATOMS OXYGEN/ MOLE SO2 ABSORBED. EXPECTED SLURRY CARRY-OVER FROM THE FIRST TO THE SECOND SCRUBBER LOOP AT WIDOWS CREEK WAS SIMULATED BY AN ARTIFICIAL BACKMIX STREAM OF UP TO 65 GPM.

A NEW LIME/ADIPIC ACID TEST BLOCK WITH AND WITHOUT FORCED OXIDATION BEGAN IN EARLY FEBRUARY ON THE SINGLE-LOOP TCA SYSTEM USING FLUE GAS WITH HIGH FLYASH LOADINGS. AT TCA INLET PH OF 7.0, 2400 TO 2900 PPM INLET SO2, L/G OF 50 GAL/ MCF, AND 15 INCHES TOTAL STATIC BED HEIGHT OF 1-7/8 INCH NITRILE FOAM SPHERES, SO2 REMOVALS WERE 83, 93, AND 97 PERCENT WITH ZERO,

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

600, AND 1200 PPM ADIPIC ACID, RESPECTIVELY, WITHOUT FORCED OXIDATION. SO2 REMOVAL REMAINED HIGH AT 91 PERCENT WITH 1200 PPM ADIPIC ACID WHEN L/G WAS REDUCED FROM 50 TO 37 GAL/MCF. WHEN OXIDATION WAS FORCED WITH ABOUT 1.8 AIR STOICHIOMETRY, NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH (TCA INLET PH) UP TO ABOUT 5.5, AND 1200 PPM ADIPIC ACID. SO2 REMOVAL ABOVE 90 PERCENT WAS OBTAINED AT TCA INLET PH AS LOW AS 5.0 WITH FORCED OXIDATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM							720			
5/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 5/79

A SERIES OF BLEED STREAM OXIDATION TESTS USING LIMESTONE AND ADIPIC ACID WAS CONDUCTED ON THE VENTURI/SPRAY TOWER DURING THE MONTH OF APRIL. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED UNDER CONDITIONS OF EITHER LOW FLUE GAS THROUGHPUT, WHICH RESULTED IN LOW BLEED RATES AND SUBSEQUENTLY HIGHER RESIDENCE TIMES IN THE OXIDATION TANK, OR RECIRCULATION AT LIQUOR BACK TO THE EFFLUENT HOLD TANK WHICH ARTIFICIALLY MAINTAINED A LOW PH IN THE OXIDATION TANK.

DURING THE MONTH OF APRIL, THE TCA WAS OPERATED WITH LIMESTONE, ADIPIC ACID AND FORCED OXIDATION USING A SINGLE TANK. AT AIR STOICHIOMETRIC RATIOS OF 1.7-2.0 ATOMS OXYGEN/MOLE SO2 ABSORBED, AN UNUSUAL SET OF CONDITIONS WAS ENCOUNTERED DURING WHICH THE LIQUID SULFITE ION LEVEL INCREASED TO A RANGE OF 800 TO 1700 PPM AND THE DEMAND FOR LIMESTONE TO MAINTAIN THE SCRUBBER INLET PH AT 5.1 INCREASED TO A RANGE OF 1.8 TO 4.0 MOLES LIMESTONE/MOLE SO2 ABSORBED. THE CAUSE HAS NOT YET BEEN DETERMINED ALTHOUGH IT WAS FOUND THAT THE SITUATION COULD BE ALLEVIATED BY EITHER INCREASING THE AIR STOICHIOMETRY TO GREATER THAN 2.2, OR BY MOVING THE LIMESTONE FEED TO A SECOND TANK DOWNSTREAM OF THE OXIDATION TANK.

BOILER NO. 10 WENT DOWN ON MAY 5TH FOR A SCHEDULED 6 WEEK BOILER OUTAGE. DURING THIS PERIOD, THE VENTURI/SPRAY TOWER WILL BE DOWN BUT THE TCA IS BEING OPERATED ON FLUE GAS FROM BOILER NO. 9 THROUGH THE NEWLY INSTALLED DUCT. DURING THIS PERIOD, THE TCA WILL COMPLETE A SERIES OF LIMESTONE/ADIPIC ACID FACTORIAL TESTS WITH AND WITHOUT FORCED OXIDATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79

BOILER NO. 10 WAS RESTARTED ON JULY 6, 1979 AFTER NINE WEEKS OF SCHEDULED MAINTENANCE OUTAGE.

START DATE 9/79 END DATE 9/79

LIMESTONE FACTORIAL TESTING WITH ADIPIC ACID ADDITION ON THE VENTURI/SPRAY TOWER SYSTEM CONTINUED THROUGHOUT THE THIRD QUARTER. THESE TESTS WERE MADE WITH TWO-LOOP OPERATION WITH FORCED OXIDATION AND SPRAY TOWER ONLY OPERATION WITHOUT FORCED OXIDATION, BOTH UNDER CLOSED-LOOP CONDITIONS. OPEN-LIQUOR-LOOP TESTS WITH TWO-LOOP OPERATION AND WITHOUT FORCED OXIDATION WERE ALSO CONDUCTED TO COMPARE THE RESULTS WITH "FRESH" ADIPIC ACID AGAINST THOSE WITH "AGED" ACID OBTAINED UNDER CLOSED-LIQUOR-LOOP CONDITIONS.

START DATE 7/79 END DATE 9/79

DURING THE THIRD QUARTER, ADDITIONAL LIMESTONE FACTORIAL TESTS WITH ADIPIC ACID WERE CONDUCTED ON THE TCA SYSTEM TO SUPPLEMENT THOSE MADE IN MAY AND JUNE. IN ADDITION, A SERIES OF LIMESTONE TESTS WITHOUT ADIPIC ACID WERE PERFORMED USING A SINGLE TANK TO INVESTIGATE THE EFFECT OF AIR STOICHIOMETRY AND OXIDATION TANK AGITATOR SPEED ON SULFITE OXIDATION. IN A SIMILAR SERIES OF TESTS CONDUCTED IN APRIL BUT WITH ADIPIC ACID, AN UNUSUAL SET OF CONDITIONS WAS ENCOUNTERED WHICH GAVE HIGH LIQUOR SULFITE

```
-----------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                                   CONCENTRATION (800-1700 PPM) AND DEMANDED HIGH LIMESTONE STOICHIOMETRY
                                   (1.8-4.0 MOLES CA/MOLE SO2 ABSORBED) TO MAINTAIN A SCRUBBER INLET PH OF
                                   5.1.  THESE PHENOMENA WERE ALSO OBSERVED DURING TESTS WITHOUT ADIPIC ACID.
                                   INSUFFICIENT SULFITE OXIDATION RATE (CAUSED BY REDUCED AIR STOICHIOMETRY
                                   AND/OR REDUCED AGITATION IN THE OXIDATION TANK) AND DECREASED AMOUNT OF
                                   SOLID CASO3 SEEDS WERE BELIEVED TO CAUSE HIGH SULFITE SUPERSATURATION
                                   (HIGH SULFITE CONCENTRATIONS) AND THE RESULTANT BLINDING OF LIMESTONE BY
                                   SULFITE (HIGH LIMESTONE STOICHIOMETRY).
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
-------------------------------------------------------------------------------------------------------------------

 COMPANY NAME                                       TENNESSEE VALLEY AUTHORITY
 PLANT NAME                                         WIDOWS CREEK
 UNIT NUMBER                                        8
 CITY                                               BRIDGEPORT
 STATE                                              ALABAMA
 GROSS UNIT GENERATING CAPACITY - MW                  550.0
 NET UNIT GENERATING CAPACITY W/FGD - MW              516.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    550.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     ******
     AVERAGE HEAT CONTENT - J/G                      23260.        ( 10000 BTU/LB)
     AVERAGE ASH CONTENT - %                           25.00
     AVERAGE MOISTURE CONTENT - %                      10.00
     AVERAGE SULFUR CONTENT - %                         3.70
     AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   LIMESTONE
     SYSTEM SUPPLIER                                TENNESSEE VALLEY AUTHORITY
     NEW/RETROFIT                                   RETROFIT
     ENERGY CONSUMPTION - %                         *******
     INITIAL START-UP DATE                          5/77
     COMMERCIAL START-UP DATE                       1/78
     SO2 DESIGN REMOVAL EFFICIENCY - %                 80.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.50
     ABSORBER SPARE CAPACITY INDEX - %                   .0
     ABSORBER SPARE COMPONENTS INDEX                     .0

 ** DISPOSAL
     TYPE                                           POND


--------------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                   672

 3/79  SYSTEM                                                                   744

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  2/79        END DATE  3/79
                         CONSTRUCTION OF THE FORCED OXIDATION TEST WAS COMPLETED AND THE TESTING
                         HAS BEGUN ALTHOUGH NO RESULTS ARE YET AVAILABLE (THIS TESTING IS BEING
                         DONE ON ONE OF THE FOUR MODULES).

             START DATE  2/79        END DATE  3/79
                         THE UNIT OUTAGE WHICH BEGAN IN OCTOBER AND WAS SCHEDULED TO END IN FEB-
                         RUARY CONTINUED THROUGH MARCH BECAUSE THERE WERE BOILER AND TURBINE
                         FAILURES AFTER A FEW START UPS.

 4/79  SYSTEM                                                                   720

 5/79  A            100.0        97.5                      83.6
       B            100.0        59.2                      50.8
       C            100.0       100.0                      89.7
       D            100.0       100.0                      87.9
       SYSTEM       100.0        90.9                      78.0    80.20            744   638    580

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/79        END DATE  5/79
                         THE VENTURI HEADERS AND NOZZLES HAVE PLUGGED WITH SCALE AND SOLIDS.  A NEW
                         VENTURI HEADER HAS BEEN INSTALLED AND IS BEING TESTED ON TRAIN B.  THE
```

```
-----------------------------------------PERFORMANCE DATA------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ----------- ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                          NEW HEADER CONSISTS OF SIX 5-INCH FULL-CONE NOZZLES WITH A 3-INCH DISCHARGE
                          ORIFICE.  THE HEADER IS INSTALLED OVER THE VENTURI THROAT TO PROVIDE GOOD
                          THROAT COVERAGE.  IF THE NEW HEADER PROVES SUCCESSFUL, NEW HEADERS WILL BE
                          INSTALLED IN ALL VENTURIS.

6/79   A         100.0       93.6                    75.7
       B         100.0       89.9                    72.6
       C         100.0       91.1                    73.6
       D          99.6       93.8                    75.8
       SYSTEM     99.9       92.1                    74.4      84.20 99.50  720   582    536

   ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  6/79        END DATE  6/79
                      THE NEW HEADER IN TRAIN B PROVED SATISFACTORY SO NEW HEADERS ARE TO BE
                      INSTALLED ON ALL VENTURIS.

          START DATE  6/79        END DATE  6/79
                      OPTIMIZATION TESTS ON UNIT 8 SCRUBBER HAVE BEGUN AND WILL BE COMPLETED BY
                      THE END OF OCTOBER.  THE TESTS WILL INCLUDE TESTING THE ADDITIONAL FIBER-
                      GLASS REINFORCED PLASTIC GRIDS, NEW ABSORBER FULL-CONE SPRAY NOZZLES,
                      POLYPROPYLENE GRID-TYPE PACKING, AND TURBULENT CONTACT ABSORBER SPHERES.

7/79   A         100.0      100.0                    44.6
       B         100.0      100.0                    41.8
       C         100.0      100.0                    42.5
       D         100.0       89.3                    34.9
       SYSTEM    100.0      100.0                    41.0      86.40 99.01  744   291    305

   ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  7/79        END DATE  7/79
                      CORROSION WAS FOUND IN THE REHEAT TUBES IN TRAIN A.  THE CORROSION WAS
                      CAUSED BY FLY ASH AND FERROUS CORROSION PRODUCTS.  CHLORIDE AND SLURRY
                      SOLIDS WERE ALSO DETECTED.  A DETAILED ANALYSIS OF THE TUBE CORROSION IS
                      BEING PERFORMED.

8/79   A          99.2      100.0                    74.3
       B         100.0      100.0                    80.6
       C          96.2       94.9                    70.2
       D          96.1      100.0                    74.9
       SYSTEM     97.9      100.0                    75.0      87.90 99.00  744   550    558

   ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  8/79        END DATE  8/79
                      THE BALL MILL WAS OUT OF SERVICE BECAUSE OF BROKEN BOLTS WHICH SECURE THE
                      INBOARD BEARING JOURNAL TO THE BALL MILL.  THE BOLTS WERE REPLACED AND THE
                      DISCHARGE END OF THE MILL WAS CLEANED.

          START DATE  8/79        END DATE  8/79
                      THE SCRUBBER OPTIMIZATION TEST CONTINUED DURING AUGUST.

9/79   A         100.0      100.0                    71.7
       B         100.0      100.0                    75.0
       C          94.4       96.7                    65.5
       D          94.2      100.0                    72.8
       SYSTEM     97.4      100.0                    71.3                   720   488    513

   ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  9/79        END DATE  9/79
                      THE LIMESTONE BUCKET ELEVATOR, WHICH FEEDS LIMESTONE INTO THE BALL MILL
                      SURGE HOPPER, FAILED ON SEPTEMBER 28.  THE FAILURE, WHICH HAS OCCURRED
                      BEFORE, WAS CAUSED BY LIMESTONE PARTICLE BUILDUP ON THE BUCKETS AND IN THE
                      BOTTOM OF THE HOUSING, RESULTING IN THE ELEVATOR JAMMING AND BREAKAGE OF
                      THE BUCKET GUIDE CHAINS.  THE ELEVATOR WILL BE REPLACED WITH BELT CONVEYORS
                      IN THE SUMMER OF 1980.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	TEXAS UTILITIES
PLANT NAME	MARTIN LAKE
UNIT NUMBER	1
CITY	TATUM
STATE	TEXAS
GROSS UNIT GENERATING CAPACITY - MW	793.0
NET UNIT GENERATING CAPACITY W/FGD - MW	750.0
EQUIVALENT SCRUBBED CAPACITY - MW	595.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	LIGNITE
AVERAGE HEAT CONTENT - J/G	17166. (7380 BTU/LB)
AVERAGE ASH CONTENT - %	8.00
AVERAGE MOISTURE CONTENT - %	33.00
AVERAGE SULFUR CONTENT - %	.90
AVERAGE CHLORIDE CONTENT - %	********
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	NONE
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	1.3
INITIAL START-UP DATE	4/77
COMMERCIAL START-UP DATE	10/78
SO2 DESIGN REMOVAL EFFICIENCY - %	********
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.40
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	34.6 (550 GPM)
** TREATMENT	
TYPE	FLYASH STABILIZED
** DISPOSAL	
TYPE	LANDFILL

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
UNIT 1 IS NOW IN FULL OPERATION ALTHOUGH A SLUDGE DISPOSAL PROBLEM STILL EXISTS.

START DATE 2/79 END DATE 4/79
THE UTILITY HAS REPLACED THE LOUVER DAMPERS WITH GUILLOTINE DAMPERS WHICH SEEM TO WORK BETTER. HOWEVER, THEY STILL HAVE PROBLEMS WITH THE GUILLOTINE DAMPERS FAILING TO SEAL WHEN THEY BECOME SCALED.

START DATE 2/79 END DATE 4/79
THERE HAVE BEEN REPORTS OF TOWER LEAKS FROM LINER FAILURE BUT IT DOESN'T SEEM TO BE SERIOUS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM							744			

TEXAS UTILITIES: MARTIN LAKE 1 (CONT.)

```
-----------------------------------------PERFORMANCE DATA---------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                               ----- ----- ----- ------ ----- ------
 6/79  SYSTEM
                                                                            720
       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  6/79
                        THE SLUDGE DISPOSAL SYSTEM IS STILL CAUSING SOME OPERATING PROBLEMS.  THE
                        PROBLEMS REPORTED LAST QUARTER WERE CAUSED BY HEAVY RAINS WHICH KNOCKED
                        OUT THE THICKENERS.
 7/79  SYSTEM

 8/79  SYSTEM                                                               744

 9/79  SYSTEM                                                               744

       ** PROBLEMS/SOLUTIONS/COMMENTS                                       720

            START DATE  7/79        END DATE  9/79
                        DURING THE THIRD QUARTER THE UTILITY REPORTED THE SYSTEM IS OPERATING WELL.
                        THE SLUDGE DISPOSAL SYSTEM PROBLEMS PLAGUING THE UNIT HAVE BEEN SOLVED.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	TEXAS UTILITIES	
PLANT NAME	MARTIN LAKE	
UNIT NUMBER	2	
CITY	TATUM	
STATE	TEXAS	
GROSS UNIT GENERATING CAPACITY - MW	793.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	750.0	
EQUIVALENT SCRUBBED CAPACITY - MW	595.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	17166.	(7380 BTU/LB)
AVERAGE ASH CONTENT - %	8.00	
AVERAGE MOISTURE CONTENT - %	33.00	
AVERAGE SULFUR CONTENT - %	.90	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH COTTRELL	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	1.3	
INITIAL START-UP DATE	5/78	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	********	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.40	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	34.6	(550 GPM)
** TREATMENT		
TYPE	FLYASH STABILIZED	
** DISPOSAL		
TYPE	LANDFILL	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
THE UTILITY REPORTS THAT OPERATIONAL PROBLEMS HAVE INCLUDED ABSORBER LINER FAILURES AND TOWER LEAKS.

START DATE 2/79 END DATE 4/79
UNIT 2 IS NOW IN FULL OPERATION ALTHOUGH A SLUDGE DISPOSAL PROBLEM STILL EXISTS.

START DATE 2/79 END DATE 4/79
THE UTILITY HAS REPLACED THE LOUVER DAMPERS WITH GUILLOTINE DAMPERS WHICH SEEM TO WORK BETTER. HOWEVER, THEY STILL HAVE PROBLEMS WITH THE GUILLOTINE DAMPERS FAILING TO SEAL WHEN THEY BECOME SCALED.

5/79	SYSTEM							744			

TEXAS UTILITIES: MARTIN LAKE 2 (CONT.)

```
------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
 6/79  SYSTEM
                                                                           720

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/79        END DATE  6/79
                         THE SLUDGE DISPOSAL SYSTEM IS STILL CAUSING SOME OPERATING PROBLEMS.  THE
                         PROBLEMS REPORTED LAST QUARTER WERE CAUSED BY HEAVY RAINS WHICH KNOCKED
                         OUT THE THICKENERS.

 7/79  SYSTEM
                                                                           744
 8/79  SYSTEM
                                                                           744
 9/79  SYSTEM
                                                                           720

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  7/79        END DATE  9/79
                         DURING THE THIRD QUARTER THE UTILITY REPORTED THE SYSTEM WAS OPERATING
                         WELL.  THE SLUDGE DISPOSAL SYSTEM PROBLEMS PLAGUING THE UNIT WERE SOLVED.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
COMPANY NAME                                      TEXAS UTILITIES
PLANT NAME                                        MARTIN LAKE
UNIT NUMBER                                       3
CITY                                              TATUM
STATE                                             TEXAS
REGULATORY CLASSIFICATION                         A
PARTICULATE EMISSION LIMITATION - NG/J              43.         (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                     516.         ( 1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                3000.0
GROSS UNIT GENERATING CAPACITY - MW                793.0
NET UNIT GENERATING CAPACITY W/FGD - MW            750.0
NET UNIT GENERATING CAPACITY WO/FGD - MW           760.0
EQUIVALENT SCRUBBED CAPACITY - MW                  595.0

** BOILER DATA
    SUPPLIER                                      COMBUSTION ENGINEERING
    TYPE                                          PULVERIZED COAL
    SERVICE LOAD                                  BASE
    COMMERCIAL SERVICE DATE                       **/**
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S          1494.51      (3167000 ACFM)
    FLUE GAS TEMPERATURE - C                        168.3       ( 335 F)
    STACK HEIGHT - M                              ******        (**** FT)
    STACK TOP DIAMETER - M                        *******       (***** FT)

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    LIGNITE
    AVERAGE HEAT CONTENT - J/G                     17166.       (  7380 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                 6972-7894
    AVERAGE ASH CONTENT - %                           8.00
    RANGE ASH CONTENT - %                         5.6-13.2
    AVERAGE MOISTURE CONTENT - %                     33.00
    RANGE MOISTURE CONTENT - %                    29.0-37.9
    AVERAGE SULFUR CONTENT - %                         .90
    RANGE SULFUR CONTENT - %                      0.5-1.5
    AVERAGE CHLORIDE CONTENT - %                  ********
    RANGE CHLORIDE CONTENT - %                    ******

** ESP
    NUMBER                                        1
    TYPE                                          COLD SIDE
    SUPPLIER                                      RESEARCH COTTRELL
    FLUE GAS CAPACITY - CU.M/S                     1494.5       (3167000 ACFM)
    FLUE GAS TEMPERATURE - C                        168.3       (  335 F)
    PRESSURE DROP - KPA                           *******       (***** IN-H2O)

** FGD SYSTEM
    SALEABLE PRODUCT/THROWAWAY PRODUCT            THROWAWAY PRODUCT
    GENERAL PROCESS TYPE                          WET SCRUBBING
    PROCESS TYPE                                  LIMESTONE
    PROCESS ADDITIVES                             NONE
    SYSTEM SUPPLIER                               RESEARCH COTTRELL
    A-E FIRM                                      C.T. MAIN
    CONSTRUCTION FIRM                             H.B. ZACHARY
    DEVELOPMENT LEVEL                             FULL SCALE
    NEW/RETROFIT                                  NEW
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.40
    INITIAL START-UP                              2/79
    ABSORBER SPARE CAPACITY INDEX - %                 .0
    ABSORBER SPARE COMPONENT INDEX                    .0

** ABSORBER
    NUMBER                                        6
    TYPE                                          PACKED TOWER
    INITIAL START UP                              2/79
    SUPPLIER                                      RESEARCH COTTRELL
    NUMBER OF STAGES                                3
    BOILER LOAD/ABSORBER - %                       12.5
    GAS FLOW - CU.M/S                             177.13        ( 375350 ACFM)
    GAS TEMPERATURE - C                           162.8         (  325 F)
```

```
TEXAS UTILITIES: MARTIN LAKE 3 (CONT.)

 ** CENTRIFUGE
     NUMBER                                        3
     OUTLET SOLIDS - %                               69.0

 ** FANS
     NUMBER                                        4
     TYPE                                        BOILER I.D.
     SERVICE - WET/DRY                           DRY
     CAPACITY - CU.M/S                             375.48        ( 795680 ACFM)

 ** MIST ELIMINATOR
     NUMBER                                      12
     TYPE                                        CHEVRON
     CONSTRUCTION MATERIAL                       POLPROPYLENE
     CONFIGURATION                               HORIZONTAL
     NUMBER OF STAGES                                2
     NUMBER OF PASSES                                3
     WASH SYSTEM                                 TOP AND BOTTOM WASH
     SUPERFICIAL GAS VELOCITY - M/S                  .2          (    .8 FT/S)
     PRESSURE DROP - KPA                             .2          ( 1.0 IN-H2O)

 ** PUMPS
     SERVICE                                     NUMBER
     -------                                     ------
     QUENCHER FEED PUMP                          ****
     SLURRY FEED                                 ****
     RECYCLE                                       54

 ** TANKS
     SERVICE                                     NUMBER
     -------                                     ------
     ABSORBER FEED                                  3

 ** REHEATER
     TYPE                                        BYPASS

 ** THICKENER
     NUMBER                                       1
     TYPE                                        GRAVITY
     DIAMETER - M                                   42.7         (140 FT)
     OUTLET SOLIDS - %                              35.0

 ** TREATMENT
     TYPE                                        FLYASH STABILIZED

 ** DISPOSAL
     NATURE                                      FINAL
     TYPE                                        LANDFILL
     LOCATION                                    ON-SITE
     TRANSPORTATION                              RAIL


-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 3/79  SYSTEM                                                                744

 4/79  SYSTEM                                                                720

        ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  3/79        END DATE  4/79
                         MARTIN LAKE UNIT 3 BECAME OPERATIONAL DURING MARCH.  NO OPERATIONAL DE-
                         TAILS ARE YET AVAILABLE.

 5/79  SYSTEM                                                                744

 6/79  SYSTEM                                                                720
```

```
-------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79        END DATE  6/79
                        THE UNIT WAS IN OPERATION DURING THIS PERIOD ALTHOUGH OPERATIONAL DATA
                        WERE NOT AVAILABLE.

 7/79  SYSTEM                                                                744

 8/79  SYSTEM                                                                744

 9/79  SYSTEM                                                                720

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  7/79        END DATE  9/79
                        DURING THE THIRD QUARTER THE UTILITY REPORTED THAT THE FGD SYSTEM RAN
                        WITHOUT ANY MAJOR OPERATIONAL PROBLEMS.
```

```
                                   SECTION 3
              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-------------------------------------------------------------------------------------------------

  COMPANY NAME                                        TEXAS UTILITIES
  PLANT NAME                                          MONTICELLO
  UNIT NUMBER                                         3
  CITY                                                MT. PLEASANT
  STATE                                               TEXAS
  GROSS UNIT GENERATING CAPACITY - MW                   800.0
  NET UNIT GENERATING CAPACITY W/FGD - MW               750.0
  EQUIVALENT SCRUBBED CAPACITY - MW                     800.0

  ** FUEL DATA
     FUEL TYPE                                        COAL
     FUEL GRADE                                       LIGNITE
     AVERAGE HEAT CONTENT - J/G                       *******       (****** BTU/LB)
     AVERAGE ASH CONTENT - %                            18.90
     AVERAGE MOISTURE CONTENT - %                       31.90
     AVERAGE SULFUR CONTENT - %                          1.50
     AVERAGE CHLORIDE CONTENT - %                         .04

  ** FGD SYSTEM
     GENERAL PROCESS TYPE                             WET SCRUBBING
     PROCESS TYPE                                     LIMESTONE
     SYSTEM SUPPLIER                                  CHEMICO
     NEW/RETROFIT                                     NEW
     ENERGY CONSUMPTION - %                           *******
     INITIAL START-UP DATE                             5/78
     COMMERCIAL START-UP DATE                         10/78
     SO2 DESIGN REMOVAL EFFICIENCY - %                  74.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.50
     ABSORBER SPARE CAPACITY INDEX - %                    .0
     ABSORBER SPARE COMPONENTS INDEX                      .0

  ** WATER LOOP
     TYPE                                             CLOSED
     FRESH MAKE-UP WATER - LITER/S                      34.4       (  546 GPM)

  ** TREATMENT
     TYPE                                             FLYASH STABILIZED

  ** DISPOSAL
     TYPE                                             LANDFILL

-------------------------------------------PERFORMANCE DATA---------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
 2/79  SYSTEM                                                              672

 3/79  SYSTEM                                                              744

 4/79  SYSTEM                                                              720

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  2/79        END DATE  4/79
                       THE UNIT IS CURRENTLY DOWN FOR A SCHEDULED OVERHAUL.  THE TOWERS HAVE
                       BEEN INSPECTED AND NO SCALING WAS FOUND.

           START DATE  2/79        END DATE  4/79
                       SOME MINOR RECYCLE PUMP LINER PROBLEMS HAVE BEEN REPORTED.

           START DATE  2/79        END DATE  4/79
                       DUE TO HIGH ASH LEVELS SOME PLATES IN THE ESP WERE KNOCKED OUT OF
                       ALIGNMENT CAUSING AN OPACITY PROBLEM.

 5/79  SYSTEM                                                              744

 6/79  SYSTEM                                                              720
```

TEXAS UTILITIES: MONTICELLO 3 (CONT.)

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 6/79
THE UNIT WAS IN OPERATION DURING THIS PERIOD ALTHOUGH OPERATIONAL DATA WERE NOT AVAILABLE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 7/79 END DATE 9/79
THE ESP WAS REBUILT AND SINCE THE INITIATION OF GAS CONDITIONING WITH AMMONIA THE OPACITY PROBLEM HAS BEEN MINIMIZED.

START DATE 7/79 END DATE 9/79
DURING THE THIRD QUARTER THE UNIT OPERATED WITHOUT ANY MAJOR PROBLEMS. SOME MINOR ABSORBER RECYCLE PUMP LINER FAILURES HAVE BEEN ENCOUNTERED.

COMPANY NAME	UTAH POWER & LIGHT	
PLANT NAME	HUNTER	
UNIT NUMBER	1	
CITY	CASTLE DALE	
STATE	UTAH	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*******	
GROSS UNIT GENERATING CAPACITY - MW	400.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	400.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*******	
EQUIVALENT SCRUBBED CAPACITY - MW	360.0	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	**/**	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	822.05	(1742000 ACFM)
FLUE GAS TEMPERATURE - C	130.0	(266 F)
STACK HEIGHT - M	183.	(600 FT)
STACK TOP DIAMETER - M	7.3	(24.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		12,200 - 12,700
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	9 - 12	
AVERAGE MOISTURE CONTENT - %	6.50	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.55	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
** ESP		
NUMBER	1	
SUPPLIER	BUELL	
** FGD SYSTEM		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	CHEMICO	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
SO2 DESIGN REMOVAL EFFICIENCY - %	80.00	
INITIAL START-UP	5/79	
** ABSORBER		
NUMBER	4	
TYPE	SPRAY TOWER	
INITIAL START UP	5/79	
SUPPLIER	CHEMICO	
NUMBER OF STAGES	4	
SHELL MATERIAL	CARBON STEEL	
SHELL LINER MATERIAL	POLYESTER FLAKEGLASS	
GAS FLOW - CU.M/S	205.51	(435500 ACFM)
GAS TEMPERATURE - C	130.0	(266 F)
L/G RATIO - L/CU.M	5.7	(43.0 GAL/1000ACF)
PRESSURE DROP - KPA	.6	(2.5 IN-H2O)
** FANS		
NUMBER	2	
TYPE	SCRUBBER FD	
CONSTRUCTION MATERIALS	CARBON STEEL	

```
EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

UTAH POWER & LIGHT: HUNTER 1 (CONT.)

     SERVICE - WET/DRY                           DRY
     CAPACITY - CU.M/S                             411.02         ( 871000 ACFM)

 ** MIST ELIMINATOR
     NUMBER                                       4
     TYPE                                        CHEVRON
     CONSTRUCTION MATERIAL                       POLYPROPYLENE
     CONFIGURATION                               HORIZONTAL
     NUMBER OF STAGES                                1
     NUMBER OF PASSES                                4
     FREEBOARD DISTANCE - M                          3.66        (12.0 FT)
     WASH SYSTEM                                 CONTINUOUS SPRAY OPERATED ON EACH OF THE 12 SECT
     SUPERFICIAL GAS VELOCITY - M/S                   .3         (  1.0 FT/S)

 ** PUMPS
     SERVICE                                     NUMBER
     -------                                     ------
     ABSORBER RECYCLE                              16

 ** REHEATER
     TYPE                                        INDIRECT
     HEATING MEDIUM                              STEAM
     TEMPERATURE BOOST - C                          26.7         (    48 F)

 ** REHEATER
     TYPE                                        BYPASS
     TEMPERATURE BOOST - C                          26.7         (    48 F)

 ** WATER LOOP
     TYPE                                        OPEN

 ** TREATMENT
     TYPE                                        FLYASH STABILIZED

 ** DISPOSAL
     NATURE                                      FINAL
     TYPE                                        POND
     LOCATION                                    ON-SITE


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER  FGD   CAP.
                                                               SO2  PART.  HOURS  HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 5/79  SYSTEM                  78.6                   32.8                  744    311   244

 6/79  SYSTEM     98.0                                96.9                  720    713   698

 7/79  SYSTEM                 100.0                   99.2                  744    738   738

 8/79  SYSTEM                 100.0                  100.0                  744    744   744

 9/79  SYSTEM                 100.0                  100.0                  720    720   720

         ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  9/79        END DATE  9/79
                           NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED BY THE UTILITY FOR THIS UNIT
                           DURING THE THIRD QUARTER 1979.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	UTAH POWER & LIGHT
PLANT NAME	HUNTINGTON
UNIT NUMBER	1
CITY	PRICE
STATE	UTAH
GROSS UNIT GENERATING CAPACITY - MW	430.0
NET UNIT GENERATING CAPACITY W/FGD - MW	400.0
EQUIVALENT SCRUBBED CAPACITY - MW	366.0

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
AVERAGE ASH CONTENT - %	10.00	
AVERAGE MOISTURE CONTENT - %	6.50	
AVERAGE SULFUR CONTENT - %	.55	
AVERAGE CHLORIDE CONTENT - %	********	

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	CHEMICO
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	1.6
INITIAL START-UP DATE	5/78
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE CAPACITY INDEX - %	2.5
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP

TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	18.9	(300 GPM)

** TREATMENT

TYPE	FLYASH STABILIZED

** DISPOSAL

TYPE	LANDFILL

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM		90.1		58.2			672	434	391	
3/79	SYSTEM		100.0		86.5			744	644	644	
4/79	SYSTEM		100.0		76.8			720	553	553	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
THE UTILITY REPORTED THAT THE PROBLEMS ENCOUNTERED DURING FEBRUARY-APRIL INCLUDED LINING FAILURE, PUMP PROBLEMS AND DAMPER PROBLEMS.

START DATE 2/79 END DATE 4/79
PROBLEMS HAVE BEEN EXPERIENCED WITH DAMPER MECHANISMS CLOGGING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM		100.0		92.6			744	689	689	
6/79	SYSTEM		62.5		54.9			720	632	395	
7/79	SYSTEM		79.7		79.5			744	742	591	
8/79	SYSTEM		30.0		27.0			744	669	201	

UTAH POWER & LIGHT: HUNTINGTON 1 (CONT.)

PERFORMANCE DATA											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM		54.9		54.3			720	712	391	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 9/79 END DATE 9/79
THE PROBLEMS ENCOUNTERED DURING THE THIRD QUARTER 1979 INCLUDED FAILURE OF CONTROL VALVES AND SOME AGITATOR PROBLEMS.

SECTION 4
SUMMARY OF FGD SYSTEMS BY COMPANY

	TOTAL		STATUS							
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
COMPANY NAME	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ALABAMA ELECTRIC COOP	2	358.	2	358.	0	0.	0	0.	0	0.
ALLEGHENY POWER SYSTEM	3	1338.	1	519.	1	519.	1	300.	0	0.
ARIZONA ELECTRIC POWER COOP	2	390.	2	390.	0	0.	0	0.	0	0.
ARIZONA PUBLIC SERVICE	8	2684.	2	469.	4	705.	2	1510.	0	0.
ASSOCIATED ELECTRIC COOP	1	670.	0	0.	1	670.	0	0.	0	0.
BASIN ELECTRIC POWER COOP	5	2680.	0	0.	2	1200.	2	1040.	1	440.
BIG RIVERS ELECTRIC	2	484.	0	0.	2	484.	0	0.	0	0.
CENTRAL ILLINOIS LIGHT	2	794.	1	378.	0	0.	0	0.	1	416.
CENTRAL ILLINOIS PUBLIC SERV	1	617.	1	617.	0	0.	0	0.	0	0.
CENTRAL MAINE POWER	1	600.	0	0.	0	0.	0	0.	1	600.
CINCINNATI GAS & ELECTRIC	1	650.	0	0.	1	650.	0	0.	0	0.
COLORADO UTE ELECTRIC ASSN.	2	894.	0	0.	2	894.	0	0.	0	0.
COLUMBUS & SOUTHERN OHIO ELEC.	4	1572.	2	822.	0	0.	0	0.	2	750.
COMMONWEALTH EDISON	1	450.	0	0.	1	450.	0	0.	0	0.
COOPERATIVE POWER ASSOCIATION	2	654.	1	327.	1	327.	0	0.	0	0.
DELMARVA POWER & LIGHT	1	180.	0	0.	1	180.	0	0.	0	0.
DUQUESNE LIGHT	2	920.	2	920.	0	0.	0	0.	0	0.
EAST KENTUCKY POWER COOP	1	500.	0	0.	1	500.	0	0.	0	0.
GENERAL PUBLIC UTILITIES	2	1600.	0	0.	0	0.	0	0.	2	1600.
HOOSIER ENERGY	2	882.	0	0.	1	441.	1	441.	0	0.
HOUSTON LIGHTING & POWER CO.	1	512.	0	0.	0	0.	1	512.	0	0.
INDIANAPOLIS POWER & LIGHT	2	1062.	1	532.	1	530.	0	0.	0	0.
KANSAS CITY POWER & LIGHT	3	1054.	3	1054.	0	0.	0	0.	0	0.
KANSAS POWER & LIGHT	4	1575.	3	1085.	1	490.	0	0.	0	0.
KENTUCKY UTILITIES	1	64.	1	64.	0	0.	0	0.	0	0.
LAKELAND UTILITIES	1	364.	0	0.	0	0.	1	364.	0	0.
LOUISVILLE GAS & ELECTRIC	10	3533.	5	1180.	3	1203.	0	0.	2	1150.
MIDDLE SOUTH UTILITIES	6	5340.	0	0.	0	0.	0	0.	6	5340.
MINNESOTA POWER & LIGHT	1	475.	0	0.	1	475.	0	0.	0	0.
MINNKOTA POWER COOPERATIVE	1	405.	1	405.	0	0.	0	0.	0	0.
MONTANA POWER	4	2120.	2	720.	2	1400.	0	0.	0	0.
MUSCATINE POWER & WATER	1	160.	0	0.	0	0.	0	0.	1	160.
NEVADA POWER	10	3125.	3	375.	0	0.	0	0.	7	2750.
NEW YORK STATE ELEC & GAS	1	870.	0	0.	0	0.	0	0.	1	870.
NIAGARA MOHAWK POWER COOP	1	100.	0	0.	1	100.	0	0.	0	0.
NORTHERN INDIANA PUB SERVICE	5	1547.	1	115.	0	0.	0	0.	4	1432.
NORTHERN STATES POWER	3	2340.	2	1480.	0	0.	0	0.	1	860.
OTTER TAIL POWER	1	440.	0	0.	1	440.	0	0.	0	0.
PACIFIC GAS & ELECTRIC	2	1600.	0	0.	0	0.	0	0.	2	1600.
PACIFIC POWER & LIGHT	1	550.	0	0.	1	550.	0	0.	0	0.
PENNSYLVANIA POWER	3	2751.	2	1834.	1	917.	0	0.	0	0.
PHILADELPHIA ELECTRIC	4	844.	1	120.	0	0.	3	724.	0	0.
POTOMAC ELECTRIC POWER	1	800.	0	0.	0	0.	0	0.	1	800.
POWER AUTHORITY OF NEW YORK	1	700.	0	0.	0	0.	0	0.	1	700.
PUBLIC SERVICE OF INDIANA	1	650.	0	0.	0	0.	1	650.	0	0.
PUBLIC SERVICE OF NEW MEXICO	4	1779.	2	711.	2	1068.	0	0.	0	0.
SALT RIVER PROJECT	3	840.	0	0.	2	560.	0	0.	1	280.
SAN MIGUEL ELECTRIC COOP	1	400.	0	0.	1	400.	0	0.	0	0.
SEMINOLE ELECTRIC	2	1240.	0	0.	0	0.	0	0.	2	1240.
SIKESTON BOARD OF MUNIC. UTIL.	1	235.	0	0.	1	235.	0	0.	0	0.
SOUTH CAROLINA PUBLIC SERVICE	3	700.	1	140.	1	280.	1	280.	0	0.
SOUTH MISSISSIPPI ELEC PWR	2	248.	2	248.	0	0.	0	0.	0	0.
SOUTHERN ILLINOIS POWER COOP	2	484.	1	184.	0	0.	0	0.	1	300.
SOUTHERN INDIANA GAS & ELEC	1	265.	1	265.	0	0.	0	0.	0	0.
SOUTHWESTERN ELECTRIC POWER	1	720.	0	0.	0	0.	1	720.	0	0.
SPRINGFIELD CITY UTILITIES	1	194.	1	194.	0	0.	0	0.	0	0.
SPRINGFIELD WATER, LIGHT & PWR	1	205.	0	0.	1	205.	0	0.	0	0.
ST. JOE ZINC	1	60.	0	0.	1	60.	0	0.	0	0.
TAMPA ELECTRIC	1	475.	0	0.	0	0.	0	0.	1	475.
TENNESSEE VALLEY AUTHORITY	7	3153.	3	570.	1	575.	2	1408.	1	600.
TEXAS MUNICIPAL POWER AGENCY	1	400.	0	0.	0	0.	1	400.	0	0.
TEXAS POWER & LIGHT	3	1882.	0	0.	1	382.	0	0.	2	1500.
TEXAS UTILITIES	8	5585.	4	2585.	0	0.	1	750.	3	2250.
UTAH POWER & LIGHT	3	1086.	2	726.	1	360.	0	0.	0	0.
WISCONSIN POWER & LIGHT	1	316.	0	0.	0	0.	1	316.	0	0.
TOTALS	161	72165.	56	19387.	42	17250.	19	9415.	44	26113.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUTING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

	TOTAL		STATUS					
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
SYSTEM SUPPLIER/PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ADL/COMBUSTION EQUIP ASSOCIATE								
DUAL ALKALI	1	288.	1	268.	0	0.	0	0.
LIME	1	500.	0	0.	1	500.	0	0.
LIME/ALKALINE FLYASH	5	2525.	3	1125.	2	1400.	0	0.
SODIUM CARBONATE	3	375.	3	375.	0	0.	0	0.
TOTAL -	10	3688.	7	1768.	3	1900.	0	0.
AIR CORRECTION DIVISION, UOP								
LIME	2	822.	2	822.	0	0.	0	0.
LIMESTONE	4	1896.	2	726.	1	450.	1	720.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
SODIUM CARBONATE	1	550.	0	0.	1	550.	0	0.
TOTAL -	8	3278.	5	1558.	2	1000.	1	720.
AMERICAN AIR FILTER								
LIME	6	1673.	3	694.	3	979.	0	0.
LIMESTONE	1	280.	0	0.	0	0.	1	280.
TOTAL -	7	1953.	3	694.	3	979.	1	280.
BABCOCK & WILCOX								
LIME	3	1688.	1	519.	2	1169.	0	0.
LIMESTONE	7	2477.	3	1198.	3	915.	1	364.
LIME/SPRAY DRYING	1	600.	0	0.	0	0.	1	600.
TOTAL -	11	4765.	4	1717.	5	2084.	2	964.
BUELL/ENVIROTECH								
DUAL ALKALI	1	617.	1	617.	0	0.	0	0.
TOTAL -	1	617.	1	617.	0	0.	0	0.
BUREAU OF MINES								
CITRATE	1	60.	0	0.	1	60.	0	0.
TOTAL -	1	60.	0	0.	1	60.	0	0.
CHEMICO								
LIME	8	4140.	6	3480.	1	360.	1	300.
LIMESTONE	3	2208.	1	800.	0	0.	2	1408.
LIME/ALKALINE FLYASH	4	895.	0	0.	3	579.	1	316.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
TOTAL -	16	7253.	8	4290.	4	939.	4	2024.
COMBUSTION ENGINEERING								
LIME	4	442.	4	442.	0	0.	0	0.
LIMESTONE	7	2932.	3	1085.	3	1447.	1	400.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.
LIME/ALKALINE FLYASH	2	654.	1	327.	1	327.	0	0.
LIME/LIMESTONE	2	708.	0	0.	2	708.	0	0.
TOTAL -	17	6216.	10	3334.	6	2482.	1	400.
DAVY POWERGAS								
WELLMAN LORD	6	2074.	3	826.	3	1248.	0	0.
TOTAL -	6	2074.	3	826.	3	1248.	0	0.
FMC CORPORATION								
DUAL ALKALI	1	265.	1	265.	0	0.	0	0.
TOTAL -	1	265.	1	265.	0	0.	0	0.
JOY MFG. CO. WESTERN PRECIPITA								
LIME/SPRAY DRYING	1	440.	0	0.	0	0.	1	440.
TOTAL -	1	440.	0	0.	0	0.	1	440.
MITSUBISHI INTERNATIONAL								
LIMESTONE	2	882.	0	0.	1	441.	1	441.
TOTAL -	2	882.	0	0.	1	441.	1	441.

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

SYSTEM SUPPLIER/PROCESS	TOTAL NO.	TOTAL MW	STATUS: OPERATIONAL NO.	OPERATIONAL MW	CONSTRUCTION NO.	CONSTRUCTION MW	CONTRACT AWARDED NO.	CONTRACT AWARDED MW
NONE								
LIMESTONE	1	595.	1	595.	0	0.	0	0.
TOTAL -	1	595.	1	595.	0	0.	0	0.
PEABODY PROCESS SYSTEMS								
LIMESTONE	4	1252.	2	358.	2	894.	0	0.
LIME/ALKALINE FLYASH	1	475.	0	0.	1	475.	0	0.
TOTAL -	5	1727.	2	358.	3	1369.	0	0.
PULLMAN KELLOGG								
LIME	1	917.	0	0.	1	917.	0	0.
LIMESTONE	4	1880.	0	0.	3	1230.	1	650.
TOTAL -	5	2797.	0	0.	4	2147.	1	650.
RESEARCH COTTRELL								
LIMESTONE	12	4860.	6	2049.	5	2061.	1	750.
TOTAL -	12	4860.	6	2049.	5	2061.	1	750.
RILEY STOKER/ENVIRONEERING								
LIMESTONE	3	626.	3	626.	0	0.	0	0.
TOTAL -	3	626.	3	626.	0	0.	0	0.
ROCKWELL INTERNATIONAL								
AQUEOUS CARBONATE	1	100.	0	0.	1	100.	0	0.
TOTAL -	1	100.	0	0.	1	100.	0	0.
TENNESSEE VALLEY AUTHORITY								
LIMESTONE	1	550.	1	550.	0	0.	0	0.
TOTAL -	1	550.	1	550.	0	0.	0	0.
UNITED ENGINEERS								
LIME	2	1510.	0	0.	0	0.	2	1510.
MAGNESIUM OXIDE	4	844.	1	120.	0	0.	3	724.
TOTAL -	6	2354.	1	120.	0	0.	5	2234.
VENDOR NOT SELECTED								
LIMESTONE	1	512.	0	0.	0	0.	1	512.
TOTAL -	1	512.	0	0.	0	0.	1	512.
WHEELABRATOR-FRYE/R.I.								
AQUEOUS CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.
TOTAL -	1	440.	0	0.	1	440.	0	0.
TOTAL -	117	46052.	56	19387.	42	17250.	19	9415.

SECTION 6
SUMMARY OF FGD SYSTEMS BY PROCESS

PROCESS	TOTAL		STATUS							
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
AQUEOUS CARBONATE	1	100.	0	0.	1	100.	0	0.	0	0.
CITRATE	1	60.	0	0.	1	60.	0	0.	0	0.
MAGNESIUM OXIDE	5	1444.	1	120.	0	0.	3	724.	1	600.
WELLMAN LORD	6	2074.	3	826.	3	1248.	0	0.	0	0.
SUBTOTAL - SALEABLE PRODUCT	13	3678.	4	946.	5	1408.	3	724.	1	600.
AQUEOUS CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.	0	0.
DUAL ALKALI	3	1170.	3	1170.	0	0.	0	0.	0	0.
LIME	27	11692.	16	5957.	8	3925.	3	1810.	0	0.
LIMESTONE	60	27716.	22	7987.	18	7438.	10	5525.	10	6766.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.	0	0.
LIME/ALKALINE FLYASH	12	4549.	4	1452.	7	2781.	1	316.	0	0.
LIME/LIMESTONE	5	1328.	2	20.	2	708.	0	0.	1	600.
LIME/SPRAY DRYING	2	1040.	0	0.	0	0.	2	1040.	0	0.
PROCESS NOT SELECTED	32	18147.	0	0.	0	0.	0	0.	32	18147.
SODIUM CARBONATE	4	925.	3	375.	1	550.	0	0.	0	0.
SUBTOTAL - THROWAWAY PRODUCT	148	68487.	52	18441.	37	15842.	16	8691.	43	25513.
TOTALS	161	72165.	56	19387.	42	17250.	19	9415.	44	26113.
SALEABLE % OF TOTAL MW		5		5		8		8		2

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
DUAL ALKALI				
A.B. BROWN	1	265.	3/79	0/ 0
CANE RUN	6	288.	4/79	0/ 0
NEWTON	1	617.	9/79	12/79
		1170.		
LIME				
BRUCE MANSFIELD	1	917.	12/75	6/76
BRUCE MANSFIELD	2	917.	7/77	0/ 0
CANE RUN	4	188.	8/76	9/77
CANE RUN	5	190.	12/77	5/79
CONESVILLE	5	411.	1/77	2/77
CONESVILLE	6	411.	6/78	0/ 0
ELRAMA	1-4	510.	10/75	10/75
GREEN RIVER	1-3	64.	9/75	6/76
HAWTHORN	3	90.	11/72	0/ 0
HAWTHORN	4	90.	8/72	0/ 0
HUNTER	1	360.	5/79	0/ 0
HUNTINGTON	1	366.	5/78	0/ 0
MILL CREEK	3	442.	8/78	3/79
PADDY'S RUN	6	72.	4/73	0/ 0
PHILLIPS	1-6	410.	7/73	0/ 0
PLEASANTS	1	519.	3/79	0/ 0
		5957.		
LIMESTONE				
APACHE	2	195.	8/78	1/79
APACHE	3	195.	6/79	4/79
CHOLLA	1	119.	10/73	12/73
CHOLLA	2	350.	4/78	0/ 0
DUCK CREEK	1	378.	9/76	8/78
JEFFREY	1	540.	8/78	0/ 0
LA CYGNE	1	874.	2/73	6/73
LAWRENCE	4	125.	1/76	0/ 0
LAWRENCE	5	420.	11/71	0/ 0
MARION	4	184.	5/79	0/ 0
MARTIN LAKE	1	595.	4/77	10/78
MARTIN LAKE	2	595.	5/78	0/ 0
MARTIN LAKE	3	595.	2/79	0/ 0
MONTICELLO	3	800.	5/78	10/78
PETERSBURG	3	532.	12/77	0/ 0
R.D. MORROW	1	124.	8/78	0/ 0
R.D. MORROW	2	124.	6/79	0/ 0
SOUTHWEST	1	194.	4/77	0/ 0
TOMBIGBEE	2	179.	9/78	0/ 0
TOMBIGBEE	3	179.	6/79	0/ 0
WIDOWS CREEK	8	550.	5/77	1/78
WINYAH	2	140.	7/77	0/ 0
		7987.		
LIMESTONE/ALKALINE FLYASH				
SHERBURNE	1	740.	3/76	5/76
SHERBURNE	2	740.	4/77	4/77
		1480.		
LIME/ALKALINE FLYASH				
COAL CREEK	1	327.	8/79	0/ 0
COLSTRIP	1	360.	9/75	11/75
COLSTRIP	2	360.	5/76	10/76
MILTON R. YOUNG	2	405.	9/77	6/78
		1452.		

SECTION 7

SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
LIME/LIMESTONE				
SHAWNEE	10A	10.	4/72	0/ 0
SHAWNEE	10B	10.	4/72	0/ 0
		20.		
MAGNESIUM OXIDE				
EDDYSTONE	1A	120.	9/75	9/75
		120.		
SODIUM CARBONATE				
REID GARDNER	1	125.	4/74	0/ 0
REID GARDNER	2	125.	4/74	0/ 0
REID GARDNER	3	125.	6/76	7/76
		375.		
WELLMAN LORD				
DEAN H. MITCHELL	11	115.	7/76	6/77
SAN JUAN	1	361.	4/78	0/ 0
SAN JUAN	2	350.	8/78	0/ 0
		826.		
TOTAL		19387.		

SECTION 8

SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY		BYPRODUCT	
		STABILIZED	UNSTABILIZED	TYPE	DISPOSITION
DUAL ALKALI					
A.B. BROWN	1		LANDFILL		
CANE RUN	6	LINED POND			
NEWTON	1				
LIME					
BRUCE MANSFIELD	1	LANDFILL			
BRUCE MANSFIELD	2	LANDFILL			
CANE RUN	4	LINED POND			
CANE RUN	5	LINED POND			
CONESVILLE	5	LANDFILL			
CONESVILLE	6	LANDFILL			
ELRAMA	1-4	LANDFILL			
GREEN RIVER	1-3		LINED POND		
HAWTHORN	3	POND			
HAWTHORN	4	POND			
HUNTER	1	POND			
HUNTINGTON	1	LANDFILL			
MILL CREEK	3	POND			
PADDY'S RUN	6	POND			
PHILLIPS	1-6	LANDFILL			
PLEASANTS	1				
LIMESTONE					
APACHE	2		POND		
APACHE	3		POND		
CHOLLA	1		POND		
CHOLLA	2		POND		
DUCK CREEK	1		LINED POND		
JEFFREY	1	POND			
LA CYGNE	1		UNLINED POND		
LAWRENCE	4	POND			
LAWRENCE	5	POND			
MARION	4	LANDFILL			
MARTIN LAKE	1	LANDFILL			
MARTIN LAKE	2	LANDFILL			
MARTIN LAKE	3	LANDFILL			
MONTICELLO	3	LANDFILL			
PETERSBURG	3	POND			
R.D. MORROW	1	LANDFILL			
R.D. MORROW	2	LANDFILL			
SOUTHWEST	1	LANDFILL			
TOMBIGBEE	2	LINED POND			
TOMBIGBEE	3	LINED POND			
WIDOWS CREEK	8		POND		
WINYAH	2		POND		
LIMESTONE/ALKALINE FLYASH					
SHERBURNE	1	LINED POND			
SHERBURNE	2	LINED POND			
LIME/ALKALINE FLYASH					
COAL CREEK	1	LINED POND			
COLSTRIP	1		POND		
COLSTRIP	2		POND		
MILTON R. YOUNG	2		MINEFILL		
LIME/LIMESTONE					
SHAWNEE	10A				
SHAWNEE	10B				

SECTION 8

SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY		BYPRODUCT	
		STABILIZED	UNSTABILIZED	TYPE	DISPOSITION
MAGNESIUM OXIDE					
EDDYSTONE	1A			SULFURIC ACID	
SODIUM CARBONATE					
REID GARDNER	1		POND		
REID GARDNER	2		POND		
REID GARDNER	3		POND		
WELLMAN LORD					
DEAN H. MITCHELL	11			ELEMENTAL SULFUR	
SAN JUAN	1		POND	ELEMENTAL SULFUR	MARKETED
SAN JUAN	2		MINEFILL	ELEMENTAL SULFUR	MARKETED

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALABAMA ELECTRIC COOP TOMBIGBEE	2	NEW	179.0	LIMESTONE PEABODY PROCESS SYSTEMS	9/78
ALABAMA ELECTRIC COOP TOMBIGBEE	3	NEW	179.0	LIMESTONE PEABODY PROCESS SYSTEMS	6/79
ALLEGHENY POWER SYSTEM PLEASANTS	1	NEW	519.0	LIME BABCOCK & WILCOX	3/79
ARIZONA ELECTRIC POWER COOP APACHE	2	NEW	195.0	LIMESTONE RESEARCH COTTRELL	8/78
ARIZONA ELECTRIC POWER COOP APACHE	3	NEW	195.0	LIMESTONE RESEARCH COTTRELL	6/79
ARIZONA PUBLIC SERVICE CHOLLA	1	RETROFIT	119.0	LIMESTONE RESEARCH COTTRELL	10/73
ARIZONA PUBLIC SERVICE CHOLLA	2	NEW	350.0	LIMESTONE RESEARCH COTTRELL	4/78
CENTRAL ILLINOIS LIGHT DUCK CREEK	1	NEW	378.0	LIMESTONE RILEY STOKER/ENVIRONEERING	9/76
CENTRAL ILLINOIS PUBLIC SERV NEWTON	1	NEW	617.0	DUAL ALKALI BUELL/ENVIROTECH	9/79
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE	5	NEW	411.0	LIME AIR CORRECTION DIVISION, UOP	1/77
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE	6	NEW	411.0	LIME AIR CORRECTION DIVISION, UOP	6/78
COOPERATIVE POWER ASSOCIATION COAL CREEK	1	NEW	327.0	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	8/79
DUQUESNE LIGHT ELRAMA	1-4	RETROFIT	510.0	LIME CHEMICO	10/75
DUQUESNE LIGHT PHILLIPS	1-6	RETROFIT	410.0	LIME CHEMICO	7/73
INDIANAPOLIS POWER & LIGHT PETERSBURG	3	NEW	532.0	LIMESTONE AIR CORRECTION DIVISION, UOP	12/77
KANSAS CITY POWER & LIGHT HAWTHORN	3	RETROFIT	90.0	LIME COMBUSTION ENGINEERING	11/72
KANSAS CITY POWER & LIGHT HAWTHORN	4	RETROFIT	90.0	LIME COMBUSTION ENGINEERING	8/72
KANSAS CITY POWER & LIGHT LA CYGNE	1	NEW	874.0	LIMESTONE BABCOCK & WILCOX	2/73
KANSAS POWER & LIGHT JEFFREY	1	NEW	540.0	LIMESTONE COMBUSTION ENGINEERING	8/78
KANSAS POWER & LIGHT LAWRENCE	4	RETROFIT	125.0	LIMESTONE COMBUSTION ENGINEERING	1/76
KANSAS POWER & LIGHT LAWRENCE	5	RETROFIT	420.0	LIMESTONE COMBUSTION ENGINEERING	11/71
KENTUCKY UTILITIES GREEN RIVER	1-3	RETROFIT	64.0	LIME AMERICAN AIR FILTER	9/75
LOUISVILLE GAS & ELECTRIC CANE RUN	4	RETROFIT	188.0	LIME AMERICAN AIR FILTER	8/76
LOUISVILLE GAS & ELECTRIC CANE RUN	5	RETROFIT	190.0	LIME COMBUSTION ENGINEERING	12/77

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
LOUISVILLE GAS & ELECTRIC CANE RUN	6	RETROFIT	288.0	DUAL ALKALI ADL/COMBUSTION EQUIP ASSOCIATE	4/79
LOUISVILLE GAS & ELECTRIC MILL CREEK	3	NEW	442.0	LIME AMERICAN AIR FILTER	8/78
LOUISVILLE GAS & ELECTRIC PADDY'S RUN	6	RETROFIT	72.0	LIME COMBUSTION ENGINEERING	4/73
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG	2	NEW	405.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	9/77
MONTANA POWER COLSTRIP	1	NEW	360.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	9/75
MONTANA POWER COLSTRIP	2	NEW	360.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	5/76
NEVADA POWER REID GARDNER	1	RETROFIT	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	4/74
NEVADA POWER REID GARDNER	2	RETROFIT	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	4/74
NEVADA POWER REID GARDNER	3	NEW	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	6/76
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL	11	RETROFIT	115.0	WELLMAN LORD DAVY POWERGAS	7/76
NORTHERN STATES POWER SHERBURNE	1	NEW	740.0	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	3/76
NORTHERN STATES POWER SHERBURNE	2	NEW	740.0	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	4/77
PENNSYLVANIA POWER BRUCE MANSFIELD	1	NEW	917.0	LIME CHEMICO	12/75
PENNSYLVANIA POWER BRUCE MANSFIELD	2	NEW	917.0	LIME CHEMICO	7/77
PHILADELPHIA ELECTRIC EDDYSTONE	1A	RETROFIT	120.0	MAGNESIUM OXIDE UNITED ENGINEERS	9/75
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	1	RETROFIT	361.0	WELLMAN LORD DAVY POWERGAS	4/78
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	2	RETROFIT	350.0	WELLMAN LORD DAVY POWERGAS	8/78
SOUTH CAROLINA PUBLIC SERVICE WINYAH	2	NEW	140.0	LIMESTONE BABCOCK & WILCOX	7/77
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW	1	NEW	124.0	LIMESTONE RILEY STOKER/ENVIRONEERING	8/78
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW	2	NEW	124.0	LIMESTONE RILEY STOKER/ENVIRONEERING	6/79
SOUTHERN ILLINOIS POWER COOP MARION	4	NEW	184.0	LIMESTONE BABCOCK & WILCOX	5/79
SOUTHERN INDIANA GAS & ELEC A.B. BROWN	1	NEW	265.0	DUAL ALKALI FMC CORPORATION	3/79
SPRINGFIELD CITY UTILITIES SOUTHWEST	1	NEW	194.0	LIMESTONE AIR CORRECTION DIVISION, UOP	4/77
TENNESSEE VALLEY AUTHORITY SHAWNEE	10A	RETROFIT	10.0	LIME/LIMESTONE AIR CORRECTION DIVISION, UOP	4/72

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
TENNESSEE VALLEY AUTHORITY SHAWNEE	10B	RETROFIT	10.0	LIME/LIMESTONE CHEMICO	4/72
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	8	RETROFIT	550.0	LIMESTONE TENNESSEE VALLEY AUTHORITY	5/77
TEXAS UTILITIES MARTIN LAKE	1	NEW	595.0	LIMESTONE NONE	4/77
TEXAS UTILITIES MARTIN LAKE	2	NEW	595.0	LIMESTONE RESEARCH COTTRELL	5/78
TEXAS UTILITIES MARTIN LAKE	3	NEW	595.0	LIMESTONE RESEARCH COTTRELL	2/79
TEXAS UTILITIES MONTICELLO	3	NEW	800.0	LIMESTONE CHEMICO	5/78
UTAH POWER & LIGHT HUNTER	1	NEW	360.0	LIME CHEMICO	5/79
UTAH POWER & LIGHT HUNTINGTON	1	NEW	366.0	LIME CHEMICO	5/78

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALLEGHENY POWER SYSTEM PLEASANTS	2	NEW	519.0	LIME BABCOCK & WILCOX	9/80
ARIZONA PUBLIC SERVICE CHOLLA	4	NEW	126.0	LIMESTONE RESEARCH COTTRELL	6/80
ARIZONA PUBLIC SERVICE FOUR CORNERS	1	RETROFIT	175.0	LIME/ALKALINE FLYASH CHEMICO	0/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	2	RETROFIT	175.0	LIME/ALKALINE FLYASH CHEMICO	0/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	3	RETROFIT	229.0	LIME/ALKALINE FLYASH CHEMICO	0/79
ASSOCIATED ELECTRIC COOP THOMAS HILL	3	NEW	670.0	LIMESTONE PULLMAN KELLOGG	1/82
BASIN ELECTRIC POWER COOP LARAMIE RIVER	1	NEW	600.0	LIMESTONE RESEARCH COTTRELL	4/80
BASIN ELECTRIC POWER COOP LARAMIE RIVER	2	NEW	600.0	LIMESTONE RESEARCH COTTRELL	10/80
BIG RIVERS ELECTRIC GREEN	1	NEW	242.0	LIME AMERICAN AIR FILTER	10/79
BIG RIVERS ELECTRIC GREEN	2	NEW	242.0	LIME AMERICAN AIR FILTER	6/80
CINCINNATI GAS & ELECTRIC EAST BEND	2	NEW	650.0	LIME BABCOCK & WILCOX	10/81
COLORADO UTE ELECTRIC ASSN. CRAIG	1	NEW	447.0	LIMESTONE PEABODY PROCESS SYSTEMS	1/80
COLORADO UTE ELECTRIC ASSN. CRAIG	2	NEW	447.0	LIMESTONE PEABODY PROCESS SYSTEMS	8/79
COMMONWEALTH EDISON POWERTON	51	RETROFIT	450.0	LIMESTONE AIR CORRECTION DIVISION, UOP	11/79
COOPERATIVE POWER ASSOCIATION COAL CREEK	2	NEW	327.0	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	10/80
DELMARVA POWER & LIGHT DELAWARE CITY	1-3	RETROFIT	180.0	WELLMAN LORD DAVY POWERGAS	4/80
EAST KENTUCKY POWER COOP SPURLOCK	2	NEW	500.0	LIME ADL/COMBUSTION EQUIP ASSOCIATE	10/80
HOOSIER ENERGY MEROM	2	NEW	441.0	LIMESTONE MITSUBISHI INTERNATIONAL	1/82
INDIANAPOLIS POWER & LIGHT PETERSBURG	4	NEW	530.0	LIMESTONE RESEARCH COTTRELL	10/83
KANSAS POWER & LIGHT JEFFREY	2	NEW	490.0	LIMESTONE COMBUSTION ENGINEERING	6/80
LOUISVILLE GAS & ELECTRIC MILL CREEK	1	RETROFIT	358.0	LIME/LIMESTONE COMBUSTION ENGINEERING	4/81
LOUISVILLE GAS & ELECTRIC MILL CREEK	2	RETROFIT	350.0	LIME/LIMESTONE COMBUSTION ENGINEERING	4/82
LOUISVILLE GAS & ELECTRIC MILL CREEK	4	NEW	495.0	LIME AMERICAN AIR FILTER	7/81
MINNESOTA POWER & LIGHT CLAY BOSWELL	4	NEW	475.0	LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS	2/80

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
MONTANA POWER COLSTRIP	3	NEW	700.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	1/84
MONTANA POWER COLSTRIP	4	NEW	700.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	0/84
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY	66	RETROFIT	100.0	AQUEOUS CARBONATE ROCKWELL INTERNATIONAL	4/82
OTTER TAIL POWER COYOTE	1	NEW	440.0	AQUEOUS CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I.	3/81
PACIFIC POWER & LIGHT JIM BRIDGER	4	NEW	550.0	SODIUM CARBONATE AIR CORRECTION DIVISION, UOP	9/79
PENNSYLVANIA POWER BRUCE MANSFIELD	3	NEW	917.0	LIME PULLMAN KELLOGG	5/80
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	3	NEW	534.0	WELLMAN LORD DAVY POWERGAS	12/79
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	4	NEW	534.0	WELLMAN LORD DAVY POWERGAS	1/82
SALT RIVER PROJECT CORONADO	1	NEW	280.0	LIMESTONE PULLMAN KELLOGG	11/79
SALT RIVER PROJECT CORONADO	2	NEW	280.0	LIMESTONE PULLMAN KELLOGG	1/80
SAN MIGUEL ELECTRIC COOP SAN MIGUEL	1	NEW	400.0	LIMESTONE BABCOCK & WILCOX	7/80
SIKESTON BOARD OF MUNIC. UTIL. SIKESTON	1	NEW	235.0	LIMESTONE BABCOCK & WILCOX	1/81
SOUTH CAROLINA PUBLIC SERVICE WINYAH	3	NEW	280.0	LIMESTONE BABCOCK & WILCOX	5/80
SPRINGFIELD WATER, LIGHT & PWR DALLMAN	3	NEW	205.0	LIMESTONE RESEARCH COTTRELL	7/80
ST. JOE ZINC G.F. WEATON	1	RETROFIT	60.0	CITRATE BUREAU OF MINES	11/79
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	7	RETROFIT	575.0	LIMESTONE COMBUSTION ENGINEERING	10/80
TEXAS POWER & LIGHT SANDOW	4	NEW	382.0	LIMESTONE COMBUSTION ENGINEERING	7/80
UTAH POWER & LIGHT HUNTER	2	NEW	360.0	LIME CHEMICO	6/80

SECTION 11
SUMMARY OF CONTRACT AWARDED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALLEGHENY POWER SYSTEM MITCHELL	33	RETROFIT	300.0	LIME CHEMICO	8/82
ARIZONA PUBLIC SERVICE FOUR CORNERS	4	RETROFIT	755.0	LIME UNITED ENGINEERS	0/82
ARIZONA PUBLIC SERVICE FOUR CORNERS	5	RETROFIT	755.0	LIME UNITED ENGINEERS	0/82
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	1	NEW	440.0	LIME/SPRAY DRYING JOY MFG. CO. WESTERN PRECIPITA	11/81
BASIN ELECTRIC POWER COOP LARAMIE RIVER	3	NEW	600.0	LIME/SPRAY DRYING BABCOCK & WILCOX	7/81
HOOSIER ENERGY MEROM	1	NEW	441.0	LIMESTONE MITSUBISHI INTERNATIONAL	4/81
HOUSTON LIGHTING & POWER CO. W.A. PARISH	8	NEW	512.0	LIMESTONE VENDOR NOT SELECTED	11/82
LAKELAND UTILITIES MCINTOSH	3	NEW	364.0	LIMESTONE BABCOCK & WILCOX	10/81
PHILADELPHIA ELECTRIC CROMBY		RETROFIT	150.0	MAGNESIUM OXIDE UNITED ENGINEERS	6/80
PHILADELPHIA ELECTRIC EDDYSTONE	1B	RETROFIT	240.0	MAGNESIUM OXIDE UNITED ENGINEERS	6/80
PHILADELPHIA ELECTRIC EDDYSTONE	2	RETROFIT	334.0	MAGNESIUM OXIDE UNITED ENGINEERS	6/80
PUBLIC SERVICE OF INDIANA GIBSON	5	NEW	650.0	LIMESTONE PULLMAN KELLOGG	0/82
SOUTH CAROLINA PUBLIC SERVICE WINYAH	4	NEW	280.0	LIMESTONE AMERICAN AIR FILTER	5/81
SOUTHWESTERN ELECTRIC POWER HENRY W. PERKEY	1	NEW	720.0	LIMESTONE AIR CORRECTION DIVISION, UOP	12/83
TENNESSEE VALLEY AUTHORITY PARADISE	1	RETROFIT	704.0	LIMESTONE CHEMICO	6/82
TENNESSEE VALLEY AUTHORITY PARADISE	2	RETROFIT	704.0	LIMESTONE CHEMICO	3/82
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK	1	NEW	400.0	LIMESTONE COMBUSTION ENGINEERING	1/82
TEXAS UTILITIES MARTIN LAKE	4	NEW	750.0	LIMESTONE RESEARCH COTTRELL	0/85
WISCONSIN POWER & LIGHT COLUMBIA	2	RETROFIT	316.0	LIME/ALKALINE FLYASH CHEMICO	1/82

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
REQUESTING/EVALUATING BIDS					
CENTRAL ILLINOIS LIGHT DUCK CREEK	2	NEW	416.0	LIMESTONE VENDOR NOT SELECTED	1/84
MIDDLE SOUTH UTILITIES ARKANSAS COAL	5	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/86
MIDDLE SOUTH UTILITIES ARKANSAS COAL	6	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/88
MIDDLE SOUTH UTILITIES LOUISIANA COAL	1	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86
MIDDLE SOUTH UTILITIES LOUISIANA COAL	2	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/88
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL	1	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL	2	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
MUSCATINE POWER & WATER MUSCATINE	9	NEW	160.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	9/82
NORTHERN INDIANA PUB SERVICE SCHAHFER	17	NEW	421.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/83
NORTHERN INDIANA PUB SERVICE SCHAHFER	18	NEW	421.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/85
NORTHERN STATES POWER SHERBURNE	3	NEW	860.0	LIMESTONE COMBUSTION ENGINEERING	5/84
SEMINOLE ELECTRIC SEMINOLE	1	NEW	620.0	LIMESTONE VENDOR NOT SELECTED	6/83
SEMINOLE ELECTRIC SEMINOLE	2	NEW	620.0	LIMESTONE VENDOR NOT SELECTED	6/85
TAMPA ELECTRIC BIG BEND	4	NEW	475.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	3/85
TENNESSEE VALLEY AUTHORITY JOHNSONVILLE	1-10	RETROFIT	600.0	MAGNESIUM OXIDE TVA/UNITED ENGINEERS	0/82
TEXAS POWER & LIGHT TWIN OAKS	1	NEW	750.0	LIMESTONE VENDOR NOT SELECTED	8/84
TEXAS POWER & LIGHT TWIN OAKS	2	NEW	750.0	LIMESTONE VENDOR NOT SELECTED	8/85
TEXAS UTILITIES FOREST GROVE	1	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/81
CONSIDERING FGD SYSTEMS					
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	2	NEW	440.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	11/83
CENTRAL MAINE POWER SEARS ISLAND	1	NEW	600.0	LIME/LIMESTONE VENDOR NOT SELECTED	11/87
COLUMBUS & SOUTHERN OHIO ELEC. POSTON	5	NEW	375.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/83
COLUMBUS & SOUTHERN OHIO ELEC. POSTON	6	NEW	375.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/89
GENERAL PUBLIC UTILITIES COHO	1	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	12/88

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
GENERAL PUBLIC UTILITIES SEWARD	7	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	12/87
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	1	NEW	575.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/84
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	2	NEW	575.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/86
NEVADA POWER HARRY ALLEN	1	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/86
NEVADA POWER HARRY ALLEN	2	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/87
NEVADA POWER HARRY ALLEN	3	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/88
NEVADA POWER HARRY ALLEN	4	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/89
NEVADA POWER REID GARDNER	4	NEW	250.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/83
NEVADA POWER WARNER VALLEY	1	NEW	250.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/85
NEVADA POWER WARNER VALLEY	2	NEW	250.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/86
NEW YORK STATE ELEC & GAS SOMERSET	1	NEW	870.0	LIMESTONE VENDOR NOT SELECTED	6/84
NORTHERN INDIANA PUB SERVICE BAILLY	7	RETROFIT	190.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/ 0
NORTHERN INDIANA PUB SERVICE BAILLY	8	RETROFIT	400.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/ 0
PACIFIC GAS & ELECTRIC MONTEZUMA	1	NEW	800.0	LIMESTONE VENDOR NOT SELECTED	6/86
PACIFIC GAS & ELECTRIC MONTEZUMA	2	NEW	800.0	LIMESTONE VENDOR NOT SELECTED	6/87
POTOMAC ELECTRIC POWER DICKERSON	4	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
POWER AUTHORITY OF NEW YORK ARTHUR KILL		NEW	700.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	11/87
SALT RIVER PROJECT CORONADO	3	NEW	280.0	LIMESTONE VENDOR NOT SELECTED	0/84
SOUTHERN ILLINOIS POWER COOP MARION	5	NEW	300.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/84
TEXAS UTILITIES MILL CREEK	1	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
TEXAS UTILITIES MILL CREEK	2	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86

SECTION 13
TOTAL FGD UNITS AND CAPACITY (MW) INSTALLED BY YEAR

YEAR	NEW ON LINE NO.	NEW ON LINE MW	TERMINATED NO.	TERMINATED MW	TOTAL ON LINE NO.	TOTAL ON LINE MW
1968	1	140.	0	0.	1	140.
1969	0	0.	1	140.	0	0.
1971	3	536.	0	0.	3	536.
1972	9	671.	0	0.	12	1207.
1973	8	1938.	1	175.	19	2970.
1974	3	606.	3	340.	19	3236.
1975	6	2018.	3	1637.	22	3618.
1976	8	2786.	3	850.	27	5554.
1977	10	4674.	1	47.	36	10180.
1978	13	4736.	0	0.	49	14916.
1979	21	6795.	1	23.	69	21688.
1980	22	8629.	0	0.	91	30317.
1981	11	5053.	0	0.	102	35370.
1982	17	8126.	0	0.	119	43496.
1983	7	3356.	0	0.	126	46852.
1984	9	5451.	0	0.	135	52303.
1985	8	4906.	0	0.	143	57209.
1986	7	4655.	0	0.	150	61864.
1987	8	5950.	0	0.	158	67814.
1988	4	3080.	0	0.	162	70894.
1989	2	875.	0	0.	164	71769.
UNDEFINED	18	5030.				

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                        COMMONWEALTH EDISON
PLANT NAME                                          WILL COUNTY
UNIT NUMBER                                         1
CITY                                                ROMEOVILLE
STATE                                               ILLINOIS
REGULATORY CLASSIFICATION                           ******
PARTICULATE EMISSION LIMITATION - NG/J                86.          (  .200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                       774.          ( 1.800 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  1147.0
GROSS UNIT GENERATING CAPACITY - MW                  167.0
NET UNIT GENERATING CAPACITY W/FGD - MW              137.0
NET UNIT GENERATING CAPACITY WO/FGD - MW            *******
EQUIVALENT SCRUBBED CAPACITY - MW                   *******

** BOILER DATA
     SUPPLIER                                       BABCOCK & WILCOX
     TYPE                                           ******
     SERVICE LOAD                                   CYCLIC
     COMMERCIAL SERVICE DATE                         0/55
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S            363.36       ( 770000 ACFM)
     FLUE GAS TEMPERATURE - C                         179.4        ( 355 F)
     STACK HEIGHT - M                                 107.         ( 350 FT)
     STACK TOP DIAMETER - M                             3.8        ( 12.4 FT)

** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     ******
     AVERAGE HEAT CONTENT - J/G                      22260.        (  9570 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                    9,100 - 10,500
     AVERAGE ASH CONTENT - %                            7.40
     RANGE ASH CONTENT - %                          3 - 16
     AVERAGE MOISTURE CONTENT - %                   ********
     RANGE MOISTURE CONTENT - %                     ******
     AVERAGE SULFUR CONTENT - %                         1.50
     RANGE SULFUR CONTENT - %                       0.3 - 4.5
     AVERAGE CHLORIDE CONTENT - %                   ********
     RANGE CHLORIDE CONTENT - %                     ******

** ESP
     NUMBER                                          1
     TYPE                                           COLD SIDE
     SUPPLIER                                       WESTERN PRECIPITATION
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %        79.0
     FLUE GAS TEMPERATURE - C                        179.4         (  355 F)

** PARTICULATE SCRUBBER
     NUMBER                                          2
     TYPE                                           ADJUSTABLE THROAT VENTURI
     SUPPLIER                                       BABCOCK & WILCOX
     SHELL MATERIAL                                 CARBON STEEL
     LINING MATERIAL                                PLASITE AND KAOCRETE
     TYPE OF NOZZLES                                STAINLESS STEEL
     FLUE GAS CAPACITY - CU.M/S                      181.7         ( 385000 ACFM)
     FLUE GAS TEMPERATURE - C                        179.4         (  355 F)
     LIQUID RECIRCULATION RATE - LITER/S             365.4         ( 5800 GPM)
     L/G RATIO - LITER/CU.M                            2.4         (18.0 GAL/1000ACF)
     PRESSURE DROP - KPA                            *******        (***** IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S                   36.6         (  120.0 FT/S)
     PARTICULATE INLET LOAD - G/CU.M                    .4         (    .16 GR/SCF)
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %        98.0


------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 3/75  A            94.0        99.2                    81.2
       B              .0          .0                      .0
       SYSTEM                                                                744    609
```

```
COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)


-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  3/75        END DATE  3/75
                          A VENTURI HOSE LEAK FORCED MODULE A OUT ONCE.

              START DATE  3/75        END DATE  3/75
                          MODULE B WAS OUT OF SERVICE TWICE FOR NO DEMAND AND ONCE AS A RESULT OF AN
                          ACCIDENTAL 50 MINUTE TRIP.

              START DATE  3/75        END DATE  3/75
                          COAL BURNED THIS MONTH AVERAGED LESS THAN ONE PERCENT SULFUR.

4/75  A            37.0        39.5                     35.0
      B              .0          .0
      SYSTEM                                              .0
                                                                            720   638

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  3/75        END DATE  4/75
                          CHICAGO FLY ASH IS TREATING MATERIAL FROM THE SCRUBBER WITH LIME AND FLY
                          ASH AND DUMPING IT INTO THE HOLDING BASIN.

              START DATE  4/75        END DATE  4/75
                          A BOILER OUTAGE FORCED MODULE A OUT OF SERVICE ONCE THIS MONTH (MODULE B
                          WAS ALREADY OUT OF SERVICE).

              START DATE  4/75        END DATE  4/75
                          COAL BURNED THIS MONTH WAS RECLAIM COAL AND VARIED IN SULFUR CONTENT.

5/75  A            84.5        84.5                     84.5
      B            37.1        37.1                     37.1
      SYSTEM
                                                                            744   744

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  4/73        END DATE  5/75
                          MODULE B WAS IN SERVICE ON MAY 20 FOR THE FIRST TIME SINCE APRIL 13, 1973.

              START DATE  5/75        END DATE  5/75
                          RECIRCULATION TANK MIXERS.

              START DATE  4/75        END DATE  5/75
                          MODULE A (WHICH WAS THE ONLY ONE OPERATING) WAS FORCED OUT TWICE IN APRIL
                          TO AVOID POND OVERBOARDING INTO THE DES PLAINES RIVER. THE SECOND OUTAGE
                          LASTED UNTIL MAY 5. DURING THE PAST SEVERAL MONTHS OF GENERALLY CONTINUOUS
                          OPERATION OF MODULE A, IT HAS BECOME APPARENT THAT THE PRESENT LIQUID
                          CIRCULATING SYSTEM CANNOT BE OPERATED IN A CONTINUOUSLY CLOSED CYCLE. THE
                          WATER IMBALANCE POSES A HIGH RISK OF OVERBOARDING FROM THE SLUDGE POND
                          DURING LONG PERIODS OF SUSTAINED OPERATON. THE FOLLOWING REVISIONS HAVE
                          BEEN MADE TO REDUCE THE WATER IMBALANCE:
                                1. THE PUMP GLAND WATER FLOWS HAVE BEEN CUT FROM 10 GPM TO 5 GPM.
                                2. THE SCRUBBER HOUSE SERVICE WATER FILTER BACKWASH HAS BEEN ROUTED
                                   OUT OF THE SYSTEM.
                                3. THE CONTINUOUS UNDERSPRAY HAS BEEN CHANGED TO AN INTERMITTENT
                                   SPRAY 5 MINUTES ON, 5 MINUTES OFF.

              START DATE  4/75        END DATE  5/75
                          THE THICKENER HAS BEEN DOWN SINCE APRIL 21 DUE TO A BROKEN GEAR AND A STUCK
                          SWEEP ARM. THE THICKENER HAS BEEN BYPASSED AND THE SLUDGE IS GOING TO THE
                          POND.

              START DATE  5/75        END DATE  5/75
                          DURING MAY, MODULE A WAS OUT FOR 45 MINUTES DUE TO A DAMPER TRIP.

              START DATE  5/75        END DATE  5/75
                          MODULE A WAS OUT ONCE FOR SPRAY NOZZLE CLEANING.

              START DATE  5/75        END DATE  5/75
                          MODULE B WAS OUT TWICE AFTER START UP, ONCE FOR A VENTURI PUMP TRIP AND
```

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                           ONCE FOR A RECIRCULATION TANK LEVEL TRIP.

               START DATE  5/75        END DATE  5/75
                           CHICAGO FLY ASH IS TREATING THE MATERIAL FROM THE SCRUBBER WITH LIME AND
                           FLY ASH AND DUMPING IT INTO THE HOLDING BASIN. A MIXER HAS BEEN INSTALLED
                           AT THE THICKENER, WHICH ENABLES THEM TO SUBSTITUTE SEALED DUMP TRUCKS FOR
                           THE CEMENT TRUCKS WHICH WERE USED IN THE PAST FOR MIXING AND TRANSPORTING
                           THE WASTE MATERIAL TO THE HOLDING BASIN.

               START DATE  5/75        END DATE  5/75
                           COAL BURNED THIS MONTH VARIED GREATLY IN SULFUR CONTENT, RANGING FROM LOW
                           SULFUR WESTERN COAL TO HIGH SULFUR ILLINOIS COAL.

 6/75  A            64.1        60.6                    54.1
       B            85.5        84.6                    75.4
       SYSTEM                                                                     720   642

       ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  6/75        END DATE 99/99
                           A REHEATER PLUGGAGE INSPECTION FORCED ONE MODULE A OUTAGE.

               START DATE  6/75        END DATE  6/75
                           A LOW LEVEL TRIP CAUSED A 35 MINUTE OUTAGE, AND NO DEMAND ACCOUNTED FOR TWO
                           MORE MODULE A OUTAGES.

               START DATE  6/75        END DATE  6/75
                           MODULE B WAS OUT FOR 95 HOURS TO CLEAN THE BOOSTER FAN AND DEMISTER.

               START DATE  6/75        END DATE  6/75
                           HIGH BOOSTER FAN VIBRATIONS CAUSED MODULE B TO SHUT DOWN ON JUNE 30.

               START DATE  6/75        END DATE  6/75
                           DURING THIS MONTH HIGH SULFUR COAL WAS BURNED IN A TWO WEEK TEST, AND LOW
                           SULFUR COAL WAS BURNED THE REST OF THE MONTH.

 7/75  A              .0          .0                      .0
       B            79.2        79.4                    73.5
       SYSTEM                                                                     744   689

       ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  6/75        END DATE  7/75
                           CHICAGO FLY ASH IS TREATING THE SCRUBBER WASTE MATERIAL WITH LIME AND FLY
                           ASH AND DUMPING IT INTO THE ON SITE HOLDING BASIN. THE MATERIAL FROM THE
                           HOLDING BASIN IS BEING TRUCKED TO AN OFF SITE DUMP.

               START DATE  7,75        END DATE  7/75
                           MODULE B WAS OUT ONCE (30 MINUTES) TO REPAIR A MINOR STEAM HEADER LEAK.

               START DATE  7/75        END DATE  7/75
                           MODULE B WAS OUT ONCE DUE TO NO DEMAND.

               START DATE  7/75        END DATE  7/75
                           LOW SULFUR COAL WAS BURNED MOST OF THIS MONT, WITH HIGH SULFUR COAL BEING
                           BURNED DURING THE LAST WEEK OF THE MONTH.

 8/75  A              .0          .0                      .0
       B            93.5       100.0                    76.4
       SYSTEM                                                                     744   565

       ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE  6/75        END DATE  8/75
                           IN JUNE, MODULE A ENCOUNTERED PLUGGAGE IN THE DEMISTER, WHICH REQUIRED ITS
                           REPLACEMENT. THE WO K WAS COMPLETED IN AUGUST.

               START DATE  6/75        END DATE  8/75
                           MODULE A WENT OUT OF SERVICE ON JUNE 20 AND REMAINED OUT THROUGH AUGUST DUE
                           TO MASSIVE REHEATER LEAKS. THERE IS PRESENTLY A HOLD ON THE NEW REHEATER
```

```
-------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                          ORDER BECAUSE OF MATERIAL FAILURES EXPERIENCED IN MODULE B'S CARBON STEEL
                          REHEATER.

               START DATE 7/75        END DATE  8/75
                          MODULE B SUFFERED TWO OUTAGES IN JULY AND ONE IN AUGUST BECAUSE OF REHEATER
                          TUBE LEAKS. THE FAILURES WERE DUE TO VIBRATION FATIGUE. THE REHEATER, WHICH
                          WAS INSTALLED IN MAY, HAS LOST SIX OF ITS TWELVE TUBE BUNDLES SO FAR. THE
                          LENGTH OF TIME THAT THE TUBES HAVE LASTED WOULD SEEM TO INDICATE THAT THERE
                          IS A DIESIGN RELATED MATERIAL DEFICIENCY. THREE OF THE TUBE BUNDLES WERE
                               REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.

               START DATE 8/75        END DATE  8/75
                          A SMALL STEAM HEADER LEAK CAUSED ONE MODULE B OUTAGE.

               START DATE 8/75        END DATE  8/75
                          MODULE B WAS OUT FOUR TIMES FOR NO DEMAND AND ONCE FOR A LOW FLOW TRIP.

               START DATE 8/75        END DATE  8/75
                          HIGH SULFUR COAL WAS BURNED ALL MONTH, CAUSING AN INCREASE IN SLUDGE
                          PRODUCTION WHICH HAS FORCED A MINIMUM SIX DAY A WEEK, TEN HOUR A DAY
                          SLUDGE DISPOSAL OPERATION. THE SLUDGE IS BEING TREATED WITH LIME AND
                          FLY ASH AND BEING DUMPED INTO THE ON SITE HOLDING POND. STABILIZED
                          MATERIAL IS BEING TRUCKED FROM THE POND TO AN OFF SITE DISPOSAL AREA.

  9/75  A
        B
        SYSTEM                                                                     720

 10/75  A            .0          .0                        .0
        B          32.3       100.0                      26.6
        SYSTEM                                                                     744   194

        ** PROBLEMS/SOLUTIONS/COMMENTS

               START DATE 10/75        END DATE 10/75
                           MODULE A WAS OFF THE ENTIRE 11 DAYS THE BOILER OPERATED THIS MONTH, WAITING
                           FOR ITS NEW REHEATER, WHICH HAS NOW BEEN RELEASED FOR MANUFACTURING BY
                           SMED.

               START DATE 10/75        END DATE 10/75
                           MODULE B HAD TWO OUTAGES, ONE FOR NO DEMAND AND ONE MINOR 15 MINUTE TRIP.

               START DATE 10/75        END DATE 10/75
                           HIGH SULFUR COAL WAS BURNED THIS MONTH WHEN THE SCRUBBER WAS IN SERVICE.

               START DATE 10/75        END DATE 10/75
                           THE SLUDGE IS BEING TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE
                           DISPOSAL AREA.

 11/75  A            .0                                    .0
        B            .0                                    .0
        SYSTEM                                                                     720     0

 12/75  A            .0                                    .0
        B            .0                                    .0
        SYSTEM                                                                     744     0

  1/76  A            .0                                    .0
        B            .0                                    .0
        SYSTEM                                                                     744     0

  2/76  A            .0                                    .0
        B            .0                                    .0
        SYSTEM                                                                     696     0

  3/76  A          30.1        45.2                      18.8
        B           8.8        20.4                       8.5
        SYSTEM                                                                     744   309
```

```
-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE 10/75         END DATE  3/76
                        UNIT 1 WAS DOWN FROM OCTOBER 11 THROUGH MARCH 19 FOR ITS BOILER TURBINE
                        AND SCRUBBER OVERHAUL. THE MAJOR ITEMS TO BE ACCOMPLISHED DURING THE
                        OUTAGE WERE:
                             1. SIMPLIFICATION OF THE MILLING SYSTEM CONTROL.
                             2. PULLING AND CLEANING OF THE MODULE B REHEATER AND RETURNING IT
                                REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.
                             3. CLEANING OF THE POND PUMP BAY.
                             4. REMOVAL OF THE VENTURI AND ABSORBER PUMP CHECK VALVES (ONE OF THEM
                                FAILED LAST SPRING AND DESTROYED A PUMP LINER AND IMPELLER).
                             5. CLEANING AND REPAIR OF THE VENTURI NOZZLES AND SUPPORTS.
                             6. REPAIR OF CORRODED REHEATER SUPPORTS.
                             7. RESETTING AND ADJUSTMENT OF ALL DAMPERS.
                             8. REVISION OF SCRUBBER CONTROLS BY REMOVING THE CONTROLS NO LONGER
                                USED OR NEEDED.
                             9. INSPECTION AND CLEANING OF THE ENTIRE SCRUBBER AND RELATED
                                EQUIPMENT.

             START DATE  3/76         END DATE  3/76
                        MODULE A WAS PUT INTO THE GAS PATH ON MARCH 22 AND REMAINED AVAILABLE FOR
                        SERVICE THE REST OF THE MONTH.

             START DATE  3/76         END DATE  3/76
                        MODULE B HAD TO REMAIN OUT OF SERVICE UNTIL MARCH 29 WHILE ITS REPAIRED
                        REHEATER WAS INSTALLED.

 4/76  A           23.0        20.0                    19.2
       B                       49.3                    47.3
       SYSTEM                                                                  720   691

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  4/76         END DATE  4/76
                        UNIT 1 RETURNED TO SERVICE APRIL 2 AFTER A SHORT TURBINE CONTROL OUTAGE.
                        BOTH MODULES CAME ON LINE JUST BEFORE THE BOILER.

             START DATE  4/76         END DATE  4/76
                        A FIVE DAY OUTAGE OF MODULE B WAS DUE TO REHEATER TUBE BUNDLE LEAKS.

             START DATE  4/76         END DATE  4/76
                        SEVERAL MODULE B OUTAGES WERE DUE TO PLUGGED ABSORBER TANK SCREENS CAUSED
                        BY MILL AND CLASSIFIER FAILURES WHICH ALLOWED ROCK TO GET INTO THE SYSTEM.
                        MODULE B WAS THOROUGHLY CLEANED.

             START DATE  4/76         END DATE  4/76
                        ONLY ONE ABSORBER PUMP IS BEING USED IN MODULE B, SINCE THE 1B2 PUMP LINER
                        FAILED AS A RESULT OF A BROKEN DISCHARGE VALVE. A REPLACEMENT LINER IS
                        BEING INSTALLED.

             START DATE  4/76         END DATE  4/76
                        A SCRUBBER TESTING AND EVALUATING PROGRAM WAS STARTED THIS MONTH. MUCH OF
                        THE LATTER TWO WEEKS OF THE MONTH WERE SPENT TRAINING THE TESTING PERSON-
                        NEL. THE PROGRAM WILL PROVIDE CHEMISTRY DATA AND OPERATING CHARACTERISTICS

 5/76  A             .0          .0                      .0
       SYSTEM                                                                  744   665

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/76         END DATE  5/76
                        A VENTRUI HOSE LEAK FORCED MODULE B OFF ONCE THIS MONTH.

             START DATE  5/76         END DATE  5/76
                        MODULE A WAS TAKEN OUT OF SERVICE ONCE BECAUSE OF A PLUGGED ABSORBER TANK
                        SCREEN.

             START DATE  5/76         END DATE  5/76
```

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

```
-----------------------------------------PERFORMANCE DATA--------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS  FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ -----  ------
                                MODULE B WAS OFF ONCE DUE TO A FOULED I.D. FAN.

                  START DATE  5/76         END DATE  5/76
                              MODULE B WAS OUT OF THE GAS PATH ONCE DUE TO NO DEMAND.

 6/76   A           52.0         44.2                     37.6
        B           86.2         84.5                     71.9
        SYSTEM
                                                                              720   612

        ** PROBLEMS/SOLUTIONS/COMMENTS

                  START DATE  4/76         END DATE  6/76
                              MODULE A SUFFERED VENTURI PUMP LINER FAILURES ON APRIL 78 WHEN AN INLET 16
                              INCH BUTTERFLY ISOLATION VALVE BROKE APART AND FELL INTO THE VENTURI PUMP.
                              BOTH THE A AND BACKUP AB VENTURI PUMP LINERS WERE DESTROYED. MODULE A
                              REMAINED OUT SERVICE UNITL JUNE 9, WHEN THE LINERS WERE REPLACED.

                  START DATE  6/76         END DATE  6/76
                              MODULE A WAS OFF ONCE FOR SHEARED BYPASS DAMPER PINS.

                  START DATE  6/76         END DATE  6/76
                              I.D. BOOSTER FAN FOULING FORCED MODULE A OFF ONCE THIS MONTH FOR ABOUT
                              164 HOURS.

                  START DATE  6/76         END DATE  6/76
                              BOTH MODULES WERE OFF TWICE DUE TO NO DEMAND. DURING THESE OUTAGES, THE
                              DEMISTERS WERE WASHED AND ABSORBER TRAY SCALE, IF ANY, WAS KNOCKED OFF.

                  START DATE  6/76         END DATE  6/76
                              MODULE B WAS OUT OF THE GAS PATH FOR SEVERAL SHORT VENTURI LOW FLOW TRIP
                              OUTAGES DUE TO A PLUGGED, SCALED VENTURI TANK SCREEN. AT THE END OF THE
                              MONTH, THE MODULE WAS TAKEN OUT TO CLEAN THE SCREEN.

                  START DATE  6/76         END DATE  6/76
                              THE MODULE B I.D. BOOSTER FAN REQUIRED CLEANING DURING THE MONTH.

                  START DATE  6/76         END DATE  6/76
                              THE REHEATER TUBES ARE SCALING, WHICH RESULTS IN A LOWER HEAT TRANSFER RATE
                              RATE, AND THEREFORE INCREASES I.D. BOOSTER FAN FOULING. THE ONLY WAY TO
                              CLEAN THE REHEATERS EFFECTIVELY IS TO REMOVE THEM, WHICH DEMANDS A SUBSTAN-
                              TIAL OUTAGE.

 7/76   A           19.9           .0                       .0
        B           86.2         90.0                     72.3
        SYSTEM
                                                                              744   598

        ** PROBLEMS/SOLUTIONS/COMMENTS

                  START DATE  6/76         END DATE  7/76
                              MODULE A WAS OFF THE FIRST PART OF THE MONTH DURING REPAIRS TO THE ABSORBER

                  START DATE  7/76         END DATE  7/76
                              THE LATTER PART OF THE MONTH THE MODULE WAS READY FOR SERVICE BUT WAS NOT
                              OPERATED BECAUSE OF THICKENER-POND SLUDGE OVERLOADING.

                  START DATE  7/76         END DATE  7/76
                              MODULE B WAS FORCED OFF ONCE TO BALANCE THE I.D. BOOSTER FAN, AND ONCE TO
                              WASH THE FAN.

                  START DATE  7/76         END DATE  7/76
                              MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND.

 8/76   A           98.2         57.6                     38.3
        B           65.4         61.4                     40.9
        SYSTEM
                                                                              744   495
```

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

```
------------------------------------------PERFORMANCE DATA----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  8/76       END DATE  8/76
                         MODULE A WAS OUT OF THE GAS PATH THE FIRST HALF OF THE MONTH T AVOID
                         THICKENER-POND OVERLOADING.

             START DATE  8/76       END DATE  8/76
                         DURING THE LATTER HALF OF THE MONTH, MODULE A WAS USED WITH THREE MINOR
                         FORCED OUTAGES AND ONE FOUR DAY NO DEMAND OUTAGE.

             START DATE  8/76       END DATE  8/76
                         MODULE B WAS OUT OF THE GAS PATH THREE TIMES DUE TO NO DEMAND.

             START DATE  8/76       END DATE  8/76
                         LOSS OF CHEMICAL CONTROL CAUSED TWO MODULE A OUTAGES.

             START DATE  8/76       END DATE  8/76
                         MODULE B WAS OFF FOR NINE DAYS DUE TO FOULING.

             START DATE  8/76       END DATE  8/76
                         SPENT SLURRY VALVE REPAIRS FORCED A MODULE B OUTAGE.

             START DATE  8/76       END DATE  8/76
                         ON AUGUST 12 THE OPERATING PH CONTROL SET POINT WAS REDUCED FROM 5.4 TO
                         5.1. IT IS BELIEVED THAT THIS LOWER PH IS THE CAUSE OF THE FOULING OUTAGE
                         OF MODULE B ON AUGUST 21. MODULE A WAS ALSO OPERATED FOR THREE DAYS, AND
                         IT, TOO, EXPERIENCED INCREASED SACLE FOULING. THE PH SET POINT WAS THEN
                         INCREASED BACK TO 5.4.
 9/76  A           42.3        28.7                    22.6
       B           79.4                                59.9
       SYSTEM                                                                 720   566

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  9/76       END DATE  9/76
                         MODULE A WENT OFF ONCE DUE TO A LOW FLOW TRIP.

             START DATE  9/76       END DATE  9/76
                         MODULE A WAS TAKEN OFF ONCE FOR CLEANING OF THE RECIRCULATION TANK AND
                         PUMPS, AND INSPECTION OF PUMP ISOLATION VALVES.

             START DATE  9/76       END DATE  9/76
                         A LINER LEAK IN 1A2 ABOSORBER PUMP ALSO FORCED MODULE A OFF.

             START DATE  9/76       END DATE  9/76
                         MODULE A WAS OUT OF TH GAS PATH TWICE DUE TO NO DEMAND.

             START DATE  9/76       END DATE  9/76
                         MODULE A WAS TAKEN OFF ONCE TO AVOID THICKENER-POND OVERLOADING.

             START DATE  9/76       END DATE  9/76
                         SPENT SLURRY VALVE TROUBLE CAUSED TWO MODULE B OUTAGES.
10/76  A           27.9        28.9                    37.9
       B           76.4        56.2                    54.8
       SYSTEM                                                                 744   726

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  3/76       END DATE 10/76
                         HIGH SULFUR ILLINOIS COAL WAS BURNED IN THE BOILER FROM MARCH THROUGH
                         OCTOBER.

             START DATE  3/76       END DATE 10/76
                         THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED TO
                         AN OFF SITE DISPOSAL AREA.

             START DATE 10/76       END DATE 10/76
```

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

---PERFORMANCE DATA---

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

MODULE A OPERATED ON ONE ABSORBER PUMP, ALLOWING TESTING ON A LOWER ABSORBER FAN.

START DATE 10/76 END DATE 10/76
MODULE A WAS OUT OF THE GAS PATH ONCE FOR AN I.D. BOBOOSTER FAN TRIP.

START DATE 10/76 END DATE 10/76
WORK ON RECIRCULATION TANK LEVEL CONTROLS CAUSED A MODULE A OUTAGE.

START DATE 10/76 END DATE 10/76
MODULE B WAS FORCED OFF ONCE TO REPAIR A REHEATER HEADER LEAK.

START DATE 10/76 END DATE 99/99
ONE MODULE B OUTAGE WAS FOR VENTURI NOZZLE CLEANING.

START DATE 10/76 END DATE 10/76
MODULE B WENT OFF FOR A VENTURI LOW FLOW TRIP.

START DATE 10/76 END DATE 10/76
MODULE B REMAINED OUT OF SERVICE WHILE MODULE A WAS BEING TESTED TO AVOID THICKENER-POND OVERLOADING.

START DATE 10/76 END DATE 11/76
A VACUUM FILTER WAS TIED IN AT THE THICKENER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	A	20.1	25.6		20.1						
	B	72.2	69.6		4.7						
	SYSTEM							720	566		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 11/76 END DATE 11/76
MODULE A OPERATED ON ONE ABSORBER PUMP DURING MODULE B OUTAGE.

START DATE 11/76 END DATE 11/76
MODULE B WAS FORCED OUT OF THE GAS PATH ONCE FOR A MILLING SYSTEM FAILURE.

START DATE 11/76 END DATE 11/76
MODULE B ENCOUNTERED A VENTURI HEADER LEAK.

START DATE 11/76 END DATE 11/76
THE VENTURI NOZZLES REQUIRED CLEANING DURING THE MONTH.

START DATE 11/76 END DATE 11/76
REPLACEMENT OF THE SPENT SLURRY VALVE NECESSITATED A MODULE OUTAGE.

START DATE 11/76 END DATE 11/76
MODULE B WAS OFF ONCE DUE TO A CHEMICAL SYSTEM UPSET.

START DATE 11/76 END DATE 11/76
MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND (MODULE A WAS NOT IN SERVICE AT THE TIME OF THE OUTAGE).

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/76	A	44.9	48.3		44.9						
	B	53.4	51.7		48.0						
	SYSTEM							744	692		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 12/76 END DATE 12/76
DURING THE LAST WEEK OF NOVEMBER, THE 1A2 ABSORBER PUMP WAS TAKEN OUT OF SERVICE FOR OVERHAUL. THE REPAIRS WERE COMPLETED ON DECEMBER 6, WHEN THE MODULE ASSUMED A ONE ABSORBER PUMP STANDBY CAPABILITY UNTIL THE 1A1 ABSORBER PUMP CAN BE REPAIRED.

START DATE 12/76 END DATE 12/76
DURING THE LAST HALF OF THE MONTH, MODUELE A OPERATED WHILE MODULE B WAS BEING REPAIRED.

START DATE 12/76 END DATE 12/76

```
-------------------------------------------------PERFORMANCE DATA-------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                            MODULE B PERFORMED SATISFACTIORILY DURING THE FIRST HALF OF THE MONTH,
                            EXPERIENCING ONLY ONE NO DEMAND OUTAGE. ON THE 17TH, HOWEVER, THE SPENT
                            SLURRY VALVE FAILED AND THE MODULE HAS REMAINED OUT OF SERVICE.

 1/77  A             98.2         98.7                      95.8
       B             13.5          1.1                       1.1
       SYSTEM                                                                    744   722

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE 12/76         END DATE 12/76
                            THE 1A1 ABSORBER PUMP WENT OUT IN LATE SEPTEMBER WITH BURNED OUT BEARINGS
                            AND REMAINED OUT THROUGH JANUARY WAITING FOR PARTS.

              START DATE 11/76         END DATE  1/77
                            LOW SULFUR COAL WAS BURNED IN THE BOILER FROM NOVEMBER THROUGH JANUARY.

              START DATE 11/76         END DATE  1/77
                            DUE TO THE LOW VOLUME OF SLUDGE PRODUCED WHILE BURNING LOW SULFUR COAL,
                            MUCH OF THE SLUDGE HANDLING TIME WAS SPENT DIGGING OUT THE ACCUMULATED
                            SLUDGE IN THE RECIRCULATION PONDS. THIS MATERIAL, ALONG WITH SCRUBBER
                            WASTE MATERIAL, WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF
                            SITE DISPOSAL AREA.

              START DATE  1/77         END DATE  1/77
                            MODULE A WAS FORCED OUT ONCE BY A FAILED SPENT SLURRY VALVE.

              START DATE  1/77         END DATE  1/77
                            PLUGGED DEMISTER UNDERSPRAYS CAUSED ANOTHER MODULE A OUTAGE.

              START DATE  1/77         END DATE  1/77
                            MODULE A WENT OUT ONCE BECAUSE OF NO DEMAND AND ONCE DUE TO A BOILER OUTAGE
                            (MODULE B WAS ALREADY OUT OF SERVICE FOR REPAIRS).

              START DATE  1/77         END DATE  1/77
                            MODULE B BECAME AVAILABLE FOR SERVICE ON JANUARY 27, AFTER REPAIRS TO THE
                            SPENT SLURRY VALVE WERE COMPLETED. DUE TO SEVERE WEATHER CONDITIONS. THE
                            MODULE WAS PLACED IN THE GAS PATH JANUARY 31.

 2/77  A             38.8         42.6                      38.8
       B             72.0         45.7                      41.7
       SYSTEM                                                                    672   613

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  2/77         END DATE  2/77
                            THERE WAS VERY LITTLE DIGGING IN THE RECIRCULATION PONDS. CHICAGO FLYASH
                            SPENT MOST OF THEIR TIME ON CLEANING AND MAINTENANCE.

 3/77  A             96.9         66.7                      64.2
       B             80.9         75.5                      73.9
       SYSTEM                                                                    744   728

       ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  3/77         END DATE  3/77
                            AN ERT SO2 ANALYZER WAS INSTALLED ON THE DISCHARGE SIDE OF MODULE B I.D.
                            BOOSTER FAN. THIS IS AN "IN SITU" ON-DISPERSIVE ANALYZER THAT CONTINUALLY
                            MEASURES AND READS OUT CONCENTRATIONS OF SO2, CO, CO2, AND NO.

              START DATE  3/77         END DATE  3/77
                            AN ABSORBER SUCTION HEADER LEAK FORCED MODULE B FROM THE GAS PATH.

              START DATE  3/77         END DATE  3/77
                            MODULE B WAS FORCED OUT DUE TO A SLURRY VALVE GASKET LEAK.

              START DATE  3/77         END DATE  3/77
                            A PLUGGED FEED SLURRY RECIRCULATION LINE WAS ENCOUNTERED IN MODULE B.

              START DATE  3/77         END DATE  3/77
```

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

HIGH SULFUR COAL WAS BURNED FOR SEVEN DAYS THIS MONTH TO PROVIDE HIGH SULFUR SLUDGE FOR THE UOP SLUDGE TEST.

START DATE 3/77 END DATE 3/77

CHICAGO FLYASH SPENT 75% OF THEIR TIME DIGGING IN THE POND. THE REST WAS SPENT ON THE THICKENER AND VACUUM FILTER IPERATION. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME FLYASH AND HAULED OFF SITE. DISPOSAL AREA.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	A	86.1	67.7		61.2						
	B	45.5	30.2		27.3						
	SYSTEM							720	650		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/77 END DATE 4/77

THE PERFORMANCE OF THE ERT SO2 ANALYZER TO DATE HAS BEEN, AT BEST, UNRELIABLE AND INCONSISTENT. THE ERT TECHNICIANS ARE OUT TO SERVICE THE ANALYZER ALMOST EVERY OTHER DAY. THE PROBLEM, ACCORDING TO ERT TECHNICIANS, IS OF A "THERMAL NATURE". WHEN THE ANALYZER REACHES A CERTAIN TEMPERATURE, A CHIP SHORTS OUT. THEY HAVE NOT BEEN ABLE TO LOCATE THE FAULTY INTEGRATED CIRCUIT YET.

START DATE 4/77 END DATE 4/77

A BOILER TUBE LEAK REPAIR FORCED MODULE A OUT OF THE GAS PATH ONCE THIS MONTH (MODULE B WAS ALREADY DOWN FOR REPAIRS).

START DATE 4/77 END DATE 4/77

MODULE B WAS FORCED OUT OF THE GAS PATH TWICE FOR AN ABSORBER SUCTION HEADER LEAK REPAIR.

START DATE 4/77 END DATE 4/77

MODULE B WAS OUT OF SERVICE ONCE TO WASH THE I. D. BOOSTER FAN.

START DATE 4/77 END DATE 4/77

HIGH SULFUR COAL WAS BURNED FOR SEVEN DAYS THIS MONTH TO PROVIDE HIGH SULFUR SLUDGE FOR THE UOP SLUDGE STUDY.

START DATE 4/77 END DATE 4/77

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME DIGGING IN THE SMALL POND, GETTING READY FOR THE MGO ADDITION AND FORCED OXIDATION TEST. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/77	A	89.4	2.2		2.0						
	B	98.0	50.9		47.3						
	SYSTEM							744	691		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/77 END DATE 5/77

THE ERT SO2 ANALYZER HAS BEEN REMOVED FROM SERVICE DUE TO A POOR PERFORMANCE RECORD OVER THE LAST THREE MONTHS. ERT IS IN THE PROCESS OF RE-ENGINEERING THEIR ANALYZER.

START DATE 5/77 END DATE 5/77

THE MGO ADDITION TEST WENT WELL. ALTHOUGH THE MGO INCREASED SO2 REMOVAL EFFICIENCY ABOUT 10%, IT DID PRACTICALLY NOTHING FOR THE TWO MORE SERIOUS PROBLEMS, SINCE THICKENER AND SLUDGE PRODUCTION AND LIMESTONE CONSUMPTION RATE WERE ABOUT THE SAME.

START DATE 5/77 END DATE 5/77

MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE INLET VALVE ON 1A2 ABSORBER PUMP FAILED.

START DATE 5/77 END DATE 5/77

MODULE B WAS TAKEN OFF TO CLEAN AND INSPECT THE REHEATER TUBES.

START DATE 5/77 END DATE 5/77

BOTH MODULES WERE FORCED OFF FOR THE FIRST FIFTEEN DAYS OF THE MONTH DUE TO

```
------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL  PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                         A FAILED 120V CONTROL TRANSFORMER FOR THE POND RETURN PUMPS. THE TRANSFORM-
                         ER HAD TO BE ORDERED FROM WESTINGHOUSE.

             START DATE  5/77        END DATE  5/77
                         HIGH SULFUR COAL HAS BURNED FOR ELEVEN DAYS DURING THE MONTH.

 6/77  A           31.8        13.3                    10.5
       B           93.2        93.4                    73.5
       SYSTEM                                                                720   566

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  6/77        END DATE  6/77
                         THE 1A1 ABSORBER PUMP IS STILL OUT OF SERVICE WAITING FOR PARTS 1A2
                         ABSORBER PUMP'S ISOLATION VALVES FORCED MODULE A OFF FOR MOST OF THE MONTH.

             START DATE  6/77        END DATE  6/77
                         MODULE A HAD ONE NO DEMAND AND ONE BOILER OUTAGE THIS MONTH.

             START DATE  6/77        END DATE  6/77
                         MODULE B WAS ALSO FORCED OFF TO CLEAN THE I.D. BOOSTER FAN.

             START DATE  6/77        END DATE  6/77
                         NO HIGH SULFUR COAL WAS BURNED THIS MONTH.

 7/77  B           70.3        41.4                    21.0
       SYSTEM                                                                744   377

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  6/77        END DATE  7/77
                         HIGH SULFUR COAL HAS BURNED FOR EIGHT DAYS THIS MONTH. LIMESTONE OPERATION
                         WAS NORMAL FOR HIGH SULFUR OPERATION.

             START DATE  7/77        END DATE  7/77
                         MODULE B WAS FORCED OUT OF THE GAS PATH ONCE TO REMOVE A PLUGGED DIFFUSER.
                         THE FINAL TEST, FORCED OXIDATION SEEMDD TO BE THE MOST SUCCESSFUL OF ALL.
                         USING LIQUID OXYGEN, UP TO 12,000 CFM OF GASEOUS O2 WAS FED INTO EACH
                         VENTURI DOWNCOMER, OXIDATION OF SULFITE TO SULFATE WAS INCREASED FROM
                         35 TO 90 %

             START DATE  7/77        END DATE  7/77
                         MODULE B WAS ALSO FORCED OFF DUE TO A LOW LEVEL IN THE SLURRY STORAGE TANK.

             START DATE  7/77        END DATE  7/77
                         MODULE B WAS ALSO FORCED OFF DUE TO REHEATER TUBE BUNDLE LEAKS.

 8/77  A           99.8        99.6                    80.8
       B            9.7        12.0                     9.7
       SYSTEM                                                                744   604

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  8/77        END DATE  8/77
                         MODULE A WAS AVAILABLE THE ENTIRE MONTH WITH JUST THE VENTURI PUMP OPERAT-
                         ING.

 9/77  A           61.0        77.8                    54.0
       B           52.3        75.4                    52.3
       SYSTEM                                                                720   499

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  9/77        END DATE  9/77
                         MODULE B ENCOUNTERED HIGH VIBERATIONS IN ITS BOOSTER FAN DURING THE FIRST
                         WEEK OF THE MONTH. AFTER THE FAN WAS BALANCED, THE MODULE OPERATED UNTIL
                         THE UNIT OUTAGE ON SEPTEMBER 21.

10/77  A             .0                                      .0
```

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

```
------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
       B            .0                                  .0
       SYSTEM                                                                744      0

11/77  A            .0                                  .0
       B           8.8         50.1                    8.8
       SYSTEM                                                                720    126

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  9/77         END DATE 11/77
                        UNIT ONE CAME UP ON NOVEMBER 25 AFTER A SIXTY-THREE DAY OUTAGE.

            START DATE 11/77         END DATE 11/77
                        MODULE B IS IN THE GAS PATH FATER EXPERIENCING SOME DIFICULTY IN BALANCING
                        ITS BOOSTER FAN.

12/77  A          42.5         42.5        47.8        42.5
       B          84.1         84.1        94.6        84.1
       SYSTEM                                                                744    661

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE 12/77         END DATE 12/77
                        PLUGGAGE WAS ENCOUNTERED IN TH EMODULE B REHEATER. BECAUSE NO SPARE REHRAT
                        COILS WERE AVAILABLE, THE UTILITY TRIED TAKING SOME COILS FROM MODULE A
                        MODULE B APPEARED TO BE MORE ORE SEVERELY PLUGGED THAN ORIGINALLY THOUGHT.

            START DATE 12/77         END DATE 12/77
                        MODULE A WAS DOWN HALF THE MONTH BECAUSE OF A MAIN STEAM LEAK WHICH COULD
                        NOT BE ISOLATED.

            START DATE  9/77         END DATE 12/77
                        MODULE A OPERATED UNTIL SEPTEMBER 19, WH E A COMBINATION OF MUD AND SCALE
                        BUILD-UP ON THE SUMP FLOOR STRUCTURALLY DAMAGED THE MODULE. REPAIRS PUT
                        THE MODULE OUT OF SERVICE UNTIL MID DECEMBER.

 1/78  A          69.0         89.9                    66.3
       B          22.0         29.8                    22.0
       SYSTEM                                                                744    549

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  1/78         END DATE 99/99
                        ON JANUARY 7, THE MODULE B I.D. BOOSTER FAN DISCHARGE DUCT STARTED VIBRAT-
                        ING WILDLY. THIS FORCED THE BOILER OFF WHILE THE SHOP MADE REPAIRS TO THE
                        DUCTWORK AND BALANCED THE FAN WITH AN I.R.D. MACHINE.

            START DATE  1/78         END DATE  1/78
                        WHEN THE UTILITY ATTEMPTED TO PUT MODULE B BACK IN THE GAS PATH, A LEAK IN
                        THE SLURRY LINE FORCED IT BACK OFF.

            START DATE  1/78         END DATE  1/78
                        A PLUGGED VENTURI PUMP FORCED MODULE B OFF THE REST OF THE MONTH.

            START DATE  1/78         END DATE  1/78
                        DURING THE OUTAGE, THE REHEATER COILS WERE CLEANED WITH A HIGH PRESSURE
                        (5000 LB) SPRAYER.

            START DATE  1/78         END DATE  1/78
                        MODULE A WAS FORCED OFF WHEN A STEAM REGULATING VALVE BLEW ITS PACKING.

            START DATE  1/78         END DATE  1/78
                        ON THE 23RD, BOTH MODULES WERE TAKEN OFF AND DRAINED TO ALLOW THE SHOP TO
                        INSTALL NEW ISOLATION VALVES IN THE ABSORBER AND VENTURI PUMPS.

            START DATE  1/78         END DATE  1/78
                        TOWARD THE END OF THE MONTH, SOME PROBLEMS WERE ENCOUNTERED WITH THE POND
                        RETURN PUMPS FREEZING.

 2/78  A          40.9         56.5                    34.4
```

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

```
---------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART.  HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
       B          69.5        92.9
       SYSTEM                                         56.5
                                                                            672   409

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  2/78        END DATE  2/78
                         MODULE A RAN INTO DIFFICULT OPERATIONG CONDITIONS THIS MONTH DUE TO RAPID
                         PLUGGING OF THE REHEAT COILS.

             START DATE  2/78        END DATE  0/ 0
                         INSPECTION AND SUBSEQUENT CLEANING OF MODULE A UNCOVERED PLUGGED SPRAY
                         NOZZLES AND DEMISTER TRAYS DUE TO NOZZLE INEFFICIENCY.

             START DATE  2/78        END DATE  2/78
                         MODULE B OPERATED VERY WELL AND AN INSPECTION SHOWED THE MODULE TO BE VERY
                         CLEAN.

3/78   A          93.5       100.0        90.6
       B          88.5        84.7        76.0
       SYSTEM                                         26.2
                                                                            744   230

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  3/78        END DATE  3/78
                         THIS MONTH, DUE TO COAL CONSERVATION, UNIT 1 WAS ON THE SYSTEM VERY LITTLE.

             START DATE  3/78        END DATE  3/78
                         MODULE B HAD DIFFICULTY FOR SEVERAL DAYS BECAUSE OF A CRACKED SHEAVE ON THE
                         VENTURI PUMP.

             START DATE  3/78        END DATE  3/78
                         HIGH PRESSURE CLEANING ON BOTH MODULES DURING THE COAL CONSERVATION ALONG
                         WITH REMOVING THE VENTURI THROAT RESTRICTOR BLOCKS PROVED BENEFICIAL IN
                         MAINTAINING BETTER CONTROL OF THE DRAFT CONDITIONS IN THE SCRUBBER.
4/78   A          99.9        99.7
       B         100.0        99.9                    92.0
       SYSTEM                                         92.2
                                                                            720   665

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  4/78        END DATE  4/78
                         THE PRESSURE DIFFERENTIAL ACROSS THE VENTURIS HAS BEEN REDUCED BY APPROXI-
                         MATELY 40% AT 140 MW BY REMOVING THE VENTURI RESTRICTOR BLOCKS. PARTICULATE
                         REMOVAL AND SOLIDS CARRYOVER COULD BE ADVERSELY AFFECTED BY THIS ACTION.
                         SINCE PARTICULATE REMOVAL AT THE VENTURI IS A FUNCTION OF WATER DROPLET
                         SIZE, WHICH IN TURN IS A FUNCTION OF PRESSURE DROP. INCREASED SOLIDS CARRY-
                         OVER COULD POSSIBLY COMPUND REHEATER PLUGGING PROBLEMS. THE UTILITY IS
                         KEEPING A CLOSE WATCH FOR PLUGGING, BUT HAS NOT YET FOUND ANYTHING UNUSUAL.

             START DATE  4/78        END DATE  4/78
                         MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH FOR A VENTURI PIPE
                         LEAK.

5/78   A           9.5        99.4
       B          89.2       100.0                    55.2
       SYSTEM                                         56.1
                                                                            744   413

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/78        END DATE 99/99
                         DURING THE LAST PART OF THE MONTH BOTH MODULES WERE FORCED OUT OF THE GAS
                         PATH DUE TO REHEATER LEAKS. IT REQUIRED A TWO DAY OUTAGE TO REMOVE THE
                         LEAKING REHEATER BUNDLES. ADDITIONAL REHATERS ARE ON ORDER AND ARE EXPECT-
                         ED TO ARRIVE IN JUNE.

6/78   A          87.1        94.5
       B          85.6       100.0                    23.7
       SYSTEM                                         25.1
                                                                            720   181
```

```
COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)


-----------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER BOILER    FGD   CAP.
                                                                SO2  PART. HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  6/78        END DATE  6/78
                         DURING A SCRUBBER INSPECTION, 25% DIEMISTER AND 75% ABSORBER SPRAY PLUGGAGE
                         WAS DISCOVERED IN MODULE A. MODULE B WAS NOT AS BAD.

             START DATE  6/78        END DATE  6/78
                         HIGH VIBRATION WAS ENCOUNTERED IN THE TURBINE BEARINGS DURING BOILER START
                         UP, CAUSING THE BOILER TO SHUT BACK DOWN.

             START DATE  6/78        END DATE  99/99
                         THE PUG MILL FOR CHICAGO ADMIXTURES HAS BEEN APPROVED, AND THE NEW SLUDGE
                         TREATMENT SYSTEM SHOULD BE OPERATING BY FALL.

             START DATE  6/78        END DATE  6/78
                         THE SCRUBBER WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE 1B1
                         ABSORBER DISCHARGE VALVE FAILED TO OPEN.

             START DATE  6/78        END DATE  6/78
                         THE BOILER WAS FORCED OFF THE LAST FOUR DAYS OF THE MONTH FOR CYCLONE
                         LEAKS. DURING THIS OUTAGE, THE A AND B MODULE SPENT SLURRY VALVES
                         WERE REPLACED.

7/78   A              97.0       100.0                    11.6
       B              99.2       100.0                    11.6
       SYSTEM
                                                                             744     77

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  7/78        END DATE  7/78
                         THE BOILER WAS PLAGUED ALL MONTH BY CYCLONE CASING LEAKS. BECAUSE OF THE
                         CYCLONE PROBLEMS AND THE COAL CONSERVATION PROGRAM, THE BOILER WAS ONLY
                         OPERATED SEVENTY-SEVEN HOURS FOR THE MONTH.

             START DATE  7/78        END DATE  7/78
                         THE BOILER DOWN TIME WAS USED FOR PREVENTATIVE MAINTENANCE ON THE SCRUBBER.
                         SIX NEW REHEATERS WERE INSTALLED AND A DRAIN VALVE ON THE SPENT SLURRY LINE
                         WAS REPAIRED.

             START DATE  7/78        END DATE  7/78
                         A VALVE FAILURE ON THE 1A1 ABSORBER PUMP FORCED THE SCRUBBER FROM THE GAS
                         PATH ONCE DURING THE MONTH.

             START DATE  7/78        END DATE  7/78
                         MODULE B EXPERIENCED A LEAKING VENTURI HEADER.

8/78   A              97.8       100.0                    59.1
       B              99.6       100.0                    59.1
       SYSTEM
                                                                             744    440

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  8/78        END DATE  8/78
                         CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER.
                         THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED
                         OFF TO AN OFF SITE DISPOSAL AREA.

             START DATE  8/78        END DATE  8/78
                         REPAIRS TO THE VENTURI EMERGENCY SPRAY VALVE CAUSED ONE BOILER OUTAGE
                         DURING THE MONTH.

             START DATE  8/78        END DATE  8/78
                         A REHEATER FLANGE LEAK WAS RESPONSIBLE FOR FORCING THE UNIT OFF.

             START DATE  8/78        END DATE  8/78
                         MODULE A WAS FORCED OFF ONCE DUE TO HIGH VIBRATION OF THE I.D. BOOSTER FAN.
                         THE PROBLEM WAS CORRECTED BY REPACKING THE COUPLING ON THE FAN.

9/78   A              77.7        95.9                    55.4
```

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	77.7	96.0		55.5						
	SYSTEM							720	416		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/77 END DATE 9/78
CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HALLED TO AN OFF SITE DISPOSAL AREA.

START DATE 9/78 END DATE 9/78
REHEATER TUBE LEAKS, ONE IN MODULE A AND FOUR IN MODULE B, CAUSED ONE BOILER OUTAGE AND CAUSED THE FGD SYSTEM TO BE UNAVAILABLE FOR A TOTAL OF NINETY HOURS. SAMPLES OF THE TUBES HAVE BEEN SUBMITTED TO O.A.D. FOR METALLURGICAL EXAMINATION.

START DATE 9/78 END DATE 9/78
A RUPTURED AIR LINE ON A VENTURI PUMP ISOLATION VALVE WOULD NOT ALLOW THE E VALVE TO GO COMPLETELY CLOSED.

START DATE 9/78 END DATE 9/78
WHEN THE A VENTURI PUMP WAS STARTED, A VENTURI SPRAY HOSE RUPTURED.

START DATE 9/78 END DATE 9/78
IT WAS DISCOVERED THAT THE MODULE A VENTURI TANK LEVEL PRESSURE SWITCH WAS NOT WORKING PROPERLY.

START DATE 9/78 END DATE 9/78
THE PUGMILL ORDERED FOR CHICAGO ADMIXTURES HAS ARRIVED ON SITE. IN OCTOBER, THEY WILL FINISH THE CONVERSION, WHICH WILL ALLOW THE MATERIAL SERVICE MIXER TRUCKS TO BE ELIMINATED.

START DATE 9/78 END DATE 9/78
IN OCTOBER, THE THICKENER WILL HAVE TO BE BYPASSED WHILE THE UTILITY DOES MAINTENANCE ON THE RAKE AND REPLACES SOME LEAKING VALVES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/78	A	100.0	100.0		35.0						
	B	100.0	100.0		35.0						
	SYSTEM							744	261		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 10/78 END DATE 10/78
LOW BOILER HOURS WERE DUE TO FOUR OUTAGES CAUSED BY HIGH BEARING METAL TEMPERATURES AND EXCESSIVE VIBRATION IN THE 1-B FORCED DRAFT FAN.

START DATE 10/78 END DATE 10/78
THE BOILER DOWN TIME WAS UTILIZED FOR CLEANING AND REPAIR OF THE VENTURI THROAT, SUMP AND SUMP SCREENS, AND INLET BLOCK DAMPERS OF MODULE A, AS WELL AS THE VENTURI AND ABSORBER TANKS AND SCREENS AND ALL ABSORBER SPRAY NOZZLES OF BOTH MODULES.

START DATE 10/78 END DATE 10/78
ON INSPECTION, IT WAS DISCOVERED THAT THE B MODULE ABSORBER DEPARTMENTAL DAMPER HAD SLIPPED 50% CLOSED. THE DAMPERS WERE JACKED OPEN AND WELDED IN PLACE.

START DATE 10/78 END DATE 10/78
TO CORRECT A HIGH PRESSURE DROP ACROSS THE MODULE B REHEATER, A NEW METHOD WAS EMPLOYED WHEREBY ONLY THE MIDDLE TUBES WERE REMOVED, ALLOWING THE TOP AND BOTTOM TUBES TO BE SEEN AND CLEANED, ELIMINATING THE REMOVAL OF ALL THE TUBES. THIS PROCEDURE CUT OUTAGE TIME FROM ONE OR TWO WEEKS TO TWO DAYS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/78	A	96.2	100.0		48.3						
	B	85.2	100.0		48.3						
	SYSTEM							720	348		

```
COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)


------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER   FGD   CAP.
------ ------ ------------ ----------- ----------- -----------  SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE 11/78        END DATE 11/78
                        THE UNIT WAS DOWN THREE TIMES THIS MONTH DUE TO A VENTURI PUMP AND TWO
                        BOOSTER FAN OUTAGES.
12/78  A             65.3        100.0                    
       B             64.5        100.0                    64.5
       SYSTEM                                             64.5
                                                                             744   480
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE 12/78        END DATE 12/78
                        REHEATER TUBE LEAKS CAUSED TWO OUTAGES.

             START DATE 12/78        END DATE 12/78
                        THE MODULE B SPENT SLURRY DRAIN WAS REPAIRED.
1/79   A             83.5        100.0
       B             62.2         87.1                    61.3
       SYSTEM                                             53.4
                                                                             744   456
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  1/79        END DATE  1/79
                         THE SO2 PLANT WAS FORCED OFF TWICE THIS MONTH DUE TO REHEATER TUBE LEAKS.
                         TWO TUBES ON MODULE A AND FOUR TUBES ON MODULE B WERE REPLACED.
             START DATE  1/79        END DATE  1/79
                         THE I.D. BOOSTER FAN ON MODULE B WAS FOULED AND HAD TO BE REPLACED.
             START DATE  1/79        END DATE  1/79
                         TWO SPECIAL SECTIONS OF VENTURI PIPING, A SIXTEEN TO EIGHT INCH ECCENTRIC
                         REDUCER AND AN OFFSET TEE WERE PREPARED BY LOCKPORT FABRICATING AND INSTAL-
                         LED THIS MONTH. THE ORIGINAL REDUCER AND TEE HAD BEEN PATCHED AND WELDED SO
                         MANY TIMES THAT THEY WERE BEYOND REPAIR.
2/79   A             93.0         91.3
       B             93.0         91.3                    54.2
       SYSTEM                                             54.2
                                                                             672   399
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  2/79        END DATE  2/79
                         THE UNIT WAS FORCED OFF ONCE FOR A MAIN STEAM HEADER LEAK.
3/79   A            100.0        100.0
       B             68.6        100.0                    46.0
       SYSTEM                                             46.0
                                                                             744   343
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  1/79        END DATE  3/79
                         THE SYSTEM WAS FORCED OUT TWICE IN FEBRUARY AND FOUR TIMES IN MARCH DUE   E
                         TO A VENTURI HEADER LEAK. A TEN FOOT SECTION OF PIPE WILL HAVE TO BE
                         REPLACED DUE TO EXTENSIVE CORROSION.
             START DATE  3/79        END DATE  3/79
                         THE SYSTEM WAS DOWN ONCE FOR A SPRAY HEADER LEAK.
             START DATE  3/79        END DATE  3/79
                         MODULE B EXPERIENCED A LEAK IN THE VENTURI DOWNCOMER. A FIVE FOOT SECTION
                         OF THE PIPE WILL HAVE TO BE REPLACED.
4/79   A
       SYSTEM

5/79   A                                                                     720
                                                           .0
```

```
-------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER    FGD   CAP.
------ ------ ------------ ----------- ----------- -----------   SO2  PART. HOURS HOURS   HOURS FACTOR
       B                                                      ----- ----- ----- ------ ----- ------
       SYSTEM                                          .0
                                                                              744      0

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  5/79        END DATE  5/79
                         UNIT 1 WAS OUT OF SERVICE THE ENTIRE MONTH DUE TO A BOILER OVERHAUL.

             START DATE 10/78        END DATE  5/79
                         CHICAGO ADMIXTURES WILL STOCKPILE THE FIXED SLUDGE ON STATION PROPERTY.

6/79   SYSTEM
                                                                              720      0

7/79   SYSTEM
                                                                              744      0

8/79   SYSTEM
                                                                              744      0

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  6/79        END DATE  8/79
                         UNIT 1 WAS OUT OF SERVICE TO REPLACE THE AIR HEATER TUBES, TUBE SHEET AND
                         HOPPERS.  DURING THIS OUTAGE, THE WORN VENTURI SPRAY NOZZLES AND DEMISTERS
                         WERE REPLACED.  WELDING LEAKS AND GENERAL CLEANING OF THE SO2 INTERNALS
                         WAS ALSO DONE AT THIS TIME.

             START DATE  6/79        END DATE  8/79
                         THE BOILER AND THE SCRUBBER ARE SCHEDULED TO RETURN TO SERVICE OCTOBER 1,
                         1979.
```

```
COMPANY NAME                                      DETROIT EDISON
PLANT NAME                                        ST. CLAIR
UNIT NUMBER                                       6
CITY                                              BELLE RIVER
STATE                                             MICHIGAN
REGULATORY CLASSIFICATION                         C
PARTICULATE EMISSION LIMITATION - NG/J            ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                     1376.          ( 3.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                 1775.0
GROSS UNIT GENERATING CAPACITY - MW                 325.0
NET UNIT GENERATING CAPACITY W/FGD - MW           *******
NET UNIT GENERATING CAPACITY WO/FGD - MW          *******
EQUIVALENT SCRUBBED CAPACITY - MW                 *******

** BOILER DATA
    SUPPLIER                                      COMBUSTION ENGINEERING
    TYPE                                          TWO-STAGE SUPERHEATER
    SERVICE LOAD                                  BASE
    COMMERCIAL SERVICE DATE                        0/61
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         *********       (******* ACFM)
    FLUE GAS TEMPERATURE - C                        132.2         ( 270 F)
    STACK HEIGHT - M                              ******          (**** FT)
    STACK TOP DIAMETER - M                        *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                    *******         (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                    9,500 - 9,600
    AVERAGE ASH CONTENT - %                          4.00
    RANGE ASH CONTENT - %                         ******
    AVERAGE MOISTURE CONTENT - %                  ********
    RANGE MOISTURE CONTENT - %                    22 - 24
    AVERAGE SULFUR CONTENT - %                       .35
    RANGE SULFUR CONTENT - %                      0.3 - 0.4
    AVERAGE CHLORIDE CONTENT - %                  ********
    RANGE CHLORIDE CONTENT - %                    ******

** ESP

** MECHANICAL COLLECTOR

** PARTICULATE SCRUBBER
    NUMBER                                        2
    TYPE                                          VENTURI
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                  MINNESOTA POWER & LIGHT
PLANT NAME                                    AURORA
UNIT NUMBER                                   1
CITY                                          AURORA
STATE                                         MINNESOTA
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J          258.         (  .600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              116.0
GROSS UNIT GENERATING CAPACITY - MW              58.0
NET UNIT GENERATING CAPACITY W/FGD - MW          57.3
NET UNIT GENERATING CAPACITY WO/FGD - MW         58.0
EQUIVALENT SCRUBBED CAPACITY - MW                58.0

** BOILER DATA
    SUPPLIER                                  COMBUSTION ENGINEERING
    TYPE                                      PULVERIZED COAL, BALANCED DRAFT
    SERVICE LOAD                              ******
    COMMERCIAL SERVICE DATE                    0/53
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       141.57       ( 300000 ACFM)
    FLUE GAS TEMPERATURE - C                    171.1        ( 340 F)
    STACK HEIGHT - M                          ******         (**** FT)
    STACK TOP DIAMETER - M                    *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 20469.        (  8800 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                       9.00
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %                 26.70
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                    1.37
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %                   .01
    RANGE CHLORIDE CONTENT - %                0.00-0.07

** MECHANICAL COLLECTOR
    NUMBER                                     0

** PARTICULATE SCRUBBER
    NUMBER                                     1
    TYPE                                      ELBAIR SPRAY-IMPINGEMENT
    SUPPLIER                                  KREBS ENGINEERING
    SHELL MATERIAL                            316 ELC STAINLESS STEEL
    LINING MATERIAL                           FLAKE-POLYESTER
    BOILER LOAD/SCRUBBER - %                    100.0
    FLUE GAS CAPACITY - CU.M/S                  137.4        ( 291160 ACFM)
    FLUE GAS TEMPERATURE - C                    171.1        (  340 F)
    L/G RATIO - LITER/CU.M                        1.1        ( 8.3 GAL/1000ACF)
    PRESSURE DROP - KPA                       *******        (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                2.1        (    7.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M               4.7        (  2.06 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M               .1        (  .040 GR/SCF)
    SO2 INLET CONCENTRATION - PPM               800.000
    SO2 OUTLET CONCENTRATION - PPM              500.000
    SO2 DESIGN REMOVAL EFFICIENCY - %            37.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
-----------------------------------------------------------------------------------------------

COMPANY NAME                                     MINNESOTA POWER & LIGHT
PLANT NAME                                       AURORA
UNIT NUMBER                                      2
CITY                                             AURORA
STATE                                            MINNESOTA
REGULATORY CLASSIFICATION                        ******
PARTICULATE EMISSION LIMITATION - NG/J            258.          (  .600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                   ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                 116.0
GROSS UNIT GENERATING CAPACITY - MW                 58.0
NET UNIT GENERATING CAPACITY W/FGD - MW             57.3
NET UNIT GENERATING CAPACITY WO/FGD - MW            58.0
EQUIVALENT SCRUBBED CAPACITY - MW                   58.0

** BOILER DATA
    SUPPLIER                                     COMBUSTION ENGINEERING
    TYPE                                         PULVERIZED COAL, BALANCED DRAFT
    SERVICE LOAD                                 ******
    COMMERCIAL SERVICE DATE                       0/53
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S          141.57       ( 300000 ACFM)
    FLUE GAS TEMPERATURE - C                       171.1        ( 340 F)
    STACK HEIGHT - M                             ******         (**** FT)
    STACK TOP DIAMETER - M                       *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                    20469.        (  8800 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                   ******
    AVERAGE ASH CONTENT - %                          9.00
    RANGE ASH CONTENT - %                        ******
    AVERAGE MOISTURE CONTENT - %                    26.70
    RANGE MOISTURE CONTENT - %                   ******
    AVERAGE SULFUR CONTENT - %                       1.37
    RANGE SULFUR CONTENT - %                     ******
    AVERAGE CHLORIDE CONTENT - %                      .01
    RANGE CHLORIDE CONTENT - %                   0.00-0.07

** MECHANICAL COLLECTOR
    NUMBER                                        0

** PARTICULATE SCRUBBER
    NUMBER                                        1
    TYPE                                         ELBAIR SPRAY-IMPINGEMENT
    SUPPLIER                                     KREBS ENGINEERING
    SHELL MATERIAL                               316 ELC STAINLESS STEEL
    LINING MATERIAL                              FLAKE-POLYESTER
    BOILER LOAD/SCRUBBER - %                      100.0
    FLUE GAS CAPACITY - CU.M/S                     137.4        ( 291160 ACFM)
    FLUE GAS TEMPERATURE - C                       171.1        (  340 F)
    L/G RATIO - LITER/CU.M                           1.1        ( 8.3 GAL/1000ACF)
    PRESSURE DROP - KPA                          *******        (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                   2.1        (     7.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                  4.7        (  2.06 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M                  .1        (  .040 GR/SCF)
    SO2 INLET CONCENTRATION - PPM                 800.000
    SO2 OUTLET CONCENTRATION - PPM                500.000
    SO2 DESIGN REMOVAL EFFICIENCY - %              37.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                  MINNESOTA POWER & LIGHT
PLANT NAME                                    CLAY BOSWELL
UNIT NUMBER                                   3
CITY                                          COHASSET
STATE                                         MINNESOTA
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J        ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW            *******
GROSS UNIT GENERATING CAPACITY - MW             350.0
NET UNIT GENERATING CAPACITY W/FGD - MW         347.1
NET UNIT GENERATING CAPACITY WO/FGD - MW        350.0
EQUIVALENT SCRUBBED CAPACITY - MW               350.0

** BOILER DATA
    SUPPLIER                                  COMBUSTION ENGINEERING
    TYPE                                      PULVERIZED COAL
    SERVICE LOAD                              BASE
    COMMERCIAL SERVICE DATE                    0/73
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       613.47       (1300000 ACFM)
    FLUE GAS TEMPERATURE - C                    123.3        ( 254 F)
    STACK HEIGHT - M                          ******         (**** FT)
    STACK TOP DIAMETER - M                    *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 19538.        (  8400 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                        9.00
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %                  26.00
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                      .92
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %                    .01
    RANGE CHLORIDE CONTENT - %                ******

** MECHANICAL COLLECTOR
    NUMBER                                      0

** PARTICULATE SCRUBBER
    NUMBER                                      1
    TYPE                                      SPRAY IMPINGEMENT
    SUPPLIER                                  KREBS ENGINEERING
    NUMBER OF STAGES                                2
    SHELL MATERIAL                            316L SS
    INTERNAL MATERIAL                         316L S.S.
    BOILER LOAD/SCRUBBER - %                    110.0
    FLUE GAS TEMPERATURE - C                    123.3        (  254 F)
    LIQUID RECIRCULATION RATE - LITER/S         714.4        (11340 GPM)
    L/G RATIO - LITER/CU.M                        1.1        ( 8.3 GAL/1000ACF)
    PRESSURE DROP - KPA                       *******        (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                2.4        (     8.0 FT/S)
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
-----------------------------------------------------------------------------------------------------------

COMPANY NAME                                    MONTANA-DAKOTA UTILITIES CO.
PLANT NAME                                      LEWIS & CLARK
UNIT NUMBER                                     ******
CITY                                            ******
STATE                                           ******
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J          ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              *******
GROSS UNIT GENERATING CAPACITY - MW             *******
NET UNIT GENERATING CAPACITY W/FGD - MW         *******
NET UNIT GENERATING CAPACITY WO/FGD - MW        *******
EQUIVALENT SCRUBBED CAPACITY - MW               *******

** BOILER DATA
    SUPPLIER                                    ******
    TYPE                                        ******
    SERVICE LOAD                                ******
    COMMERCIAL SERVICE DATE                     **/**
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       ********        (******* ACFM)
    FLUE GAS TEMPERATURE - C                    *******         (**** F)
    STACK HEIGHT - M                            ******          (**** FT)
    STACK TOP DIAMETER - M                      *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  LIGNITE
    AVERAGE HEAT CONTENT - J/G                  *******         (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                  ******
    AVERAGE ASH CONTENT - %                         9.00
    RANGE ASH CONTENT - %                       ******
    AVERAGE MOISTURE CONTENT - %                ********
    RANGE MOISTURE CONTENT - %                  ******
    AVERAGE SULFUR CONTENT - %                       .45
    RANGE SULFUR CONTENT - %                    ******
    AVERAGE CHLORIDE CONTENT - %                ********
    RANGE CHLORIDE CONTENT - %                  ******

** MECHANICAL COLLECTOR
    NUMBER                                        1

** PARTICULATE SCRUBBER
    TYPE                                        VENTURI-FLOODED DISC
    SUPPLIER                                    RESEARCH COTTERELL
    L/G RATIO - LITER/CU.M                          1.7         (13.0 GAL/1000ACF)
    PRESSURE DROP - KPA                         *******         (***** IN-H20)
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME
PLANT NAME                                        PACIFIC POWER & LIGHT
UNIT NUMBER                                       DAVE JOHNSTON
CITY                                              4
STATE                                             GLENROCK
REGULATORY CLASSIFICATION                         WYOMING
PARTICULATE EMISSION LIMITATION - NG/J            ******
SO2 EMISSION LIMITATION - NG/J                      90.          (  .210 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                 215.          (  .500 LB/MMBTU)
GROSS UNIT GENERATING CAPACITY - MW               *******
NET UNIT GENERATING CAPACITY W/FGD - MW            330.0
NET UNIT GENERATING CAPACITY WO/FGD - MW           326.5
EQUIVALENT SCRUBBED CAPACITY - MW                  330.0
                                                    33.0
** BOILER DATA
    SUPPLIER
    TYPE                                          COMBUSTION ENGINEERING
    SERVICE LOAD                                  PULVERIZED COAL, BALANCED DRAFT
    COMMERCIAL SERVICE DATE                       ******
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         **/**
    FLUE GAS TEMPERATURE - C                        707.85       (1500000 ACFM)
    STACK HEIGHT - M                                132.2        ( 270 F)
    STACK TOP DIAMETER - M                           76.         ( 250 FT)
                                                  *******        (***** FT)
** FUEL DATA
    FUEL TYPE
    FUEL GRADE                                    COAL
    AVERAGE HEAT CONTENT - J/G                    SUBBITUMINOUS
    RANGE HEAT CONTENT - BTU/LB                    17282.        (  7430 BTU/LB)
    AVERAGE ASH CONTENT - %                                       5,000-9,000
    RANGE ASH CONTENT - %                            12.00
    AVERAGE MOISTURE CONTENT - %                  ******
    RANGE MOISTURE CONTENT - %                       26.00
    AVERAGE SULFUR CONTENT - %                    ******
    RANGE SULFUR CONTENT - %                           .50
    AVERAGE CHLORIDE CONTENT - %                  ******
    RANGE CHLORIDE CONTENT - %                         .04
                                                  ******
** PARTICULATE SCRUBBER
    NUMBER
    TYPE                                           3
    SUPPLIER                                      VENTURI, PLUMB BOB
    SHELL MATERIAL                                CHEMICO
    LINING MATERIAL                               STEEL, 3/8" AT VENTURI THROAT
    FLUE GAS CAPACITY - CU.M/S                    POLYESTER-LINED STEEL
    FLUE GAS TEMPERATURE - C                        327.5        ( 694000 ACFM)
    LIQUID RECIRCULATION RATE - LITER/S             135.0        (   275 F)
    L/G RATIO - LITER/CU.M                          409.5        ( 6500 GPM)
    PRESSURE DROP - KPA                               1.3        ( 9.4 GAL/1000ACF)
    PARTICULATE INLET LOAD - G/CU.M               *******        (***** IN-H2O)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %         9.2        (  4.00 GR/SCF)
    SO2 INLET CONCENTRATION - PPM                  99.7
    SO2 DESIGN REMOVAL EFFICIENCY - %             459.000
                                                   40.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
-----------------------------------------------------------------------------------------------------
COMPANY NAME                                      POTOMAC ELECTRIC POWER
PLANT NAME                                        CHALK POINT
UNIT NUMBER                                       4
CITY                                              ******
STATE                                             MARYLAND
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J            ******       (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                 1892.0
GROSS UNIT GENERATING CAPACITY - MW                 630.0
NET UNIT GENERATING CAPACITY W/FGD - MW             630.0
NET UNIT GENERATING CAPACITY WO/FGD - MW          *******
EQUIVALENT SCRUBBED CAPACITY - MW                 *******

** BOILER DATA
     SUPPLIER                                     ******
     TYPE                                         ******
     SERVICE LOAD                                 BASE
     COMMERCIAL SERVICE DATE                      **/**
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        ********     (******* ACFM)
     FLUE GAS TEMPERATURE - C                     *******      (**** F)
     STACK HEIGHT - M                             ******       (**** FT)
     STACK TOP DIAMETER - M                       *******      (***** FT)

** FUEL DATA
     FUEL TYPE                                    OIL
     FUEL GRADE                                   ******
     AVERAGE HEAT CONTENT - J/G                   *******      (****** BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                ******
     AVERAGE ASH CONTENT - %                      ********
     RANGE ASH CONTENT - %                        ******
     AVERAGE MOISTURE CONTENT - %                 ********
     RANGE MOISTURE CONTENT - %                   ******
     AVERAGE SULFUR CONTENT - %                   ********
     RANGE SULFUR CONTENT - %                     ******
     AVERAGE CHLORIDE CONTENT - %                 ********
     RANGE CHLORIDE CONTENT - %                   ******
```

```
                                  SECTION 14
              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS
-----------------------------------------------------------------------------------------------

 COMPANY NAME                                  POTOMAC ELECTRIC POWER
 PLANT NAME                                    DICKERSON
 UNIT NUMBER                                   1
 CITY                                          DICKERSON
 STATE                                         MARYLAND
 REGULATORY CLASSIFICATION                     ******
 PARTICULATE EMISSION LIMITATION - NG/J        ******          (****** LB/MMBTU)
 SO2 EMISSION LIMITATION - NG/J                ******          (****** LB/MMBTU)
 NET PLANT GENERATING CAPACITY - MW             1348.0
 GROSS UNIT GENERATING CAPACITY - MW             190.0
 NET UNIT GENERATING CAPACITY W/FGD - MW         183.0
 NET UNIT GENERATING CAPACITY WO/FGD - MW      *******
 EQUIVALENT SCRUBBED CAPACITY - MW             *******

 ** BOILER DATA
     SUPPLIER                                  ******
     TYPE                                      ******
     SERVICE LOAD                              ******
     COMMERCIAL SERVICE DATE                   **/**
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S     ********        (******* ACFM)
     FLUE GAS TEMPERATURE - C                  *******         (**** F)
     STACK HEIGHT - M                          ******          (**** FT)
     STACK TOP DIAMETER - M                    *******         (***** FT)

 ** FUEL DATA
     FUEL TYPE                                 COAL
     FUEL GRADE                                ******
     AVERAGE HEAT CONTENT - J/G                 27214.         ( 11700 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                ******
     AVERAGE ASH CONTENT - %                      14.00
     RANGE ASH CONTENT - %                     ******
     AVERAGE MOISTURE CONTENT - %              ********
     RANGE MOISTURE CONTENT - %                ******
     AVERAGE SULFUR CONTENT - %                    2.00
     RANGE SULFUR CONTENT - %                  ******
     AVERAGE CHLORIDE CONTENT - %              ********
     RANGE CHLORIDE CONTENT - %                ******

 ** PARTICULATE SCRUBBER
     NUMBER OF STAGES                               2
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
-----------------------------------------------------------------------------------------------------

COMPANY NAME                                         POTOMAC ELECTRIC POWER
PLANT NAME                                           DICKERSON
UNIT NUMBER                                          2
CITY                                                 DICKERSON
STATE                                                MARYLAND
REGULATORY CLASSIFICATION                            ******
PARTICULATE EMISSION LIMITATION - NG/J               ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                       ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                    1348.0
GROSS UNIT GENERATING CAPACITY - MW                    190.0
NET UNIT GENERATING CAPACITY W/FGD - MW                183.0
NET UNIT GENERATING CAPACITY WO/FGD - MW             *******
EQUIVALENT SCRUBBED CAPACITY - MW                    *******

** BOILER DATA
    SUPPLIER                                         ******
    TYPE                                             ******
    SERVICE LOAD                                     ******
    COMMERCIAL SERVICE DATE                          **/**
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S            ********       (******* ACFM)
    FLUE GAS TEMPERATURE - C                         *******        (**** F)
    STACK HEIGHT - M                                 ******         (**** FT)
    STACK TOP DIAMETER - M                           *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                        COAL
    FUEL GRADE                                       ******
    AVERAGE HEAT CONTENT - J/G                        27214.        ( 11700 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                      ******
    AVERAGE ASH CONTENT - %                             14.00
    RANGE ASH CONTENT - %                            ******
    AVERAGE MOISTURE CONTENT - %                     ********
    RANGE MOISTURE CONTENT - %                       ******
    AVERAGE SULFUR CONTENT - %                           2.00
    RANGE SULFUR CONTENT - %                         ******
    AVERAGE CHLORIDE CONTENT - %                     ********
    RANGE CHLORIDE CONTENT - %                       ******

** PARTICULATE SCRUBBER
    NUMBER OF STAGES                                    2
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                    POTOMAC ELECTRIC POWER
PLANT NAME                                      DICKERSON
UNIT NUMBER                                     3
CITY                                            DICKERSON
STATE                                           MARYLAND
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J          ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    688.          ( 1.600 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                548.0
GROSS UNIT GENERATING CAPACITY - MW               190.0
NET UNIT GENERATING CAPACITY W/FGD - MW           183.0
NET UNIT GENERATING CAPACITY WO/FGD - MW        *******
EQUIVALENT SCRUBBED CAPACITY - MW               *******

** BOILER DATA
     SUPPLIER                                   COMBUSTION ENGINEERING
     TYPE                                       PULVERIZED COAL
     SERVICE LOAD                               BASE
     COMMERCIAL SERVICE DATE                     0/62
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        278.42        ( 590000 ACFM)
     FLUE GAS TEMPERATURE - C                     126.1         ( 259 F)
     STACK HEIGHT - M                             122.          ( 400 FT)
     STACK TOP DIAMETER - M                     *******         (****** FT)

** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 ******
     AVERAGE HEAT CONTENT - J/G                  27214.         ( 11700 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                  ******
     AVERAGE ASH CONTENT - %                        14.00
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %               ********
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                      2.00
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

** ESP
     NUMBER                                     1
     SUPPLIER                                   RESEARCH COTTRELL
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     94.0

** PARTICULATE SCRUBBER
     NUMBER                                     1
     TYPE                                       ADJUSTABLE VENTURI
     SUPPLIER                                   CHEMICO
     BOILER LOAD/SCRUBBER - %                      50.0
     FLUE GAS CAPACITY - CU.M/S                   139.2         ( 295000 ACFM)
     FLUE GAS TEMPERATURE - C                     126.1         (  259 F)
     L/G RATIO - LITER/CU.M                         2.7         (20.0 GAL/1000ACF)
     PRESSURE DROP - KPA                        *******         (***** IN-H2O)
```

```
                                        EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

                                                   SECTION 14
                    DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS
------------------------------------------------------------------------------------------------------------------

 COMPANY NAME
 PLANT NAME                                      PUBLIC SERVICE OF COLORADO
 UNIT NUMBER                                     ARAPAHOE
 CITY                                            4
 STATE                                           DENVER
 REGULATORY CLASSIFICATION                       COLORADO
 PARTICULATE EMISSION LIMITATION - NG/J          ******
 SO2 EMISSION LIMITATION - NG/J                     43.         (  .100 LB/MMBTU)
 NET PLANT GENERATING CAPACITY - MW              ******         (****** LB/MMBTU)
 GROSS UNIT GENERATING CAPACITY - MW             *******
 NET UNIT GENERATING CAPACITY W/FGD - MW            11.2
 NET UNIT GENERATING CAPACITY WO/FGD - MW          109.8
 EQUIVALENT SCRUBBED CAPACITY - MW               *******
                                                    11.2
 ** BOILER DATA
      SUPPLIER
      TYPE                                       ******
      SERVICE LOAD                               PULVERIZED COAL
      COMMERCIAL SERVICE DATE                    ******
      MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       0/55
      FLUE GAS TEMPERATURE - C                     245.39       ( 520000 ACFM)
      STACK HEIGHT - M                             148.9        ( 300 F)
      STACK TOP DIAMETER - M                     ******         (**** FT)
                                                 *******        (***** FT)
 ** FUEL DATA
      FUEL TYPE
      FUEL GRADE                                 COAL
      AVERAGE HEAT CONTENT - J/G                 SUBBITUMINOUS
      RANGE HEAT CONTENT - BTU/LB                 23725.        ( 10200 BTU/LB)
      AVERAGE ASH CONTENT - %                                     ******
      RANGE ASH CONTENT - %                          9.30
      AVERAGE MOISTURE CONTENT - %               ******
      RANGE MOISTURE CONTENT - %                    13.70
      AVERAGE SULFUR CONTENT - %                 ******
      RANGE SULFUR CONTENT - %                        .95
      AVERAGE CHLORIDE CONTENT - %               ******
      RANGE CHLORIDE CONTENT - %                      .01
                                                 ******
 ** FUEL DATA
      FUEL TYPE
      FUEL GRADE                                 COAL
      AVERAGE HEAT CONTENT - J/G                 ******
      RANGE HEAT CONTENT - BTU/LB                 23493.        ( 10100 BTU/LB)
      AVERAGE ASH CONTENT - %                                     ******
      RANGE ASH CONTENT - %                         12.50
      AVERAGE MOISTURE CONTENT - %               ******
      RANGE MOISTURE CONTENT - %                    11.20
      AVERAGE SULFUR CONTENT - %                 ******
      RANGE SULFUR CONTENT - %                        .65
      AVERAGE CHLORIDE CONTENT - %               ******
      RANGE CHLORIDE CONTENT - %                      .01
                                                 ******
 ** ESP
      NUMBER
                                                 1
 ** MECHANICAL COLLECTOR
      NUMBER
                                                 1
 ** PARTICULATE SCRUBBER
      NUMBER
      TYPE                                       2
      SUPPLIER                                   TCA
      NUMBER OF STAGES                           AIR CORRECTION DIVISION, UOP
      SHELL MATERIAL                                3
      LINING MATERIAL                            CARBON STEEL
      INTERNAL MATERIAL                          RUBBER
      L/G RATIO - LITER/CU.M                     STAINLESS STEEL, PLASTIC SPHERES
      PRESSURE DROP - KPA                            7.5        (56.0 GAL/1000ACF)
      SUPERFICIAL GAS VELOCITY - M/S             *******        (***** IN-H2O)
      PARTICULATE INLET LOAD - G/CU.M                3.4        (   11.0 FT/S)
      PARTICULATE OUTLET LOAD - G/CU.M               1.8        (   .80 GR/SCF)
      PARTICULATE DESIGN REMOVAL EFFICIENCY - %       .0        (  .020 GR/SCF)
                                                    97.0
```

SO2 INLET CONCENTRATION - PPM	500.000
SO2 OUTLET CONCENTRATION - PPM	350.000
SO2 DESIGN REMOVAL EFFICIENCY - %	30.0

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                      PUBLIC SERVICE OF COLORADO
PLANT NAME                                        CHEROKEE
UNIT NUMBER                                       1
CITY                                              DENVER
STATE                                             COLORADO
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J              43.        (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  710.0
GROSS UNIT GENERATING CAPACITY - MW                 115.0
NET UNIT GENERATING CAPACITY W/FGD - MW             100.0
NET UNIT GENERATING CAPACITY WO/FGD - MW            115.0
EQUIVALENT SCRUBBED CAPACITY - MW                   102.2

** BOILER DATA
    SUPPLIER                                      BABCOCK & WILCOX
    TYPF                                          PULVERIZED COAL
    SERVICE LOAD                                  ******
    COMMERCIAL SERVICE DATE                        0/57
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S           245.39     ( 520000 ACFM)
    FLUF GAS TEMPERATURE - C                        146.1      ( 295 F)
    STACK HEIGHT - M                              ******       (**** FT)
    STACK TOP DIAMETER - M                        *******      (***** FT)

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                     23493.      ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                 ******
    AVERAGE ASH CONTENT - %                          12.50
    RANGE ASH CONTENT - %                         ******
    AVERAGE MOISTURE CONTENT - %                     11.30
    RANGE MOISTURE CONTENT - %                    ******
    AVERAGE SULFUR CONTENT - %                         .65
    RANGE SULFUR CONTENT - %                      ******
    AVERAGE CHLORIDE CONTENT - %                       .01
    RANGE CHLORIDE CONTENT - %                    ******

** ESP
    NUMBER                                          1

** MECHANICAL COLLECTOR
    NUMBER                                          1

** PARTICULATE SCRUBBER
    NUMPER                                          1
    TYPE                                          TCA
    SUPPLIER                                      AIR CORRECTION DIVISION, UOP
    NUMBER OF STAGES                                  3
    SHELL MATERIAL                                CARBON STEEL
    LINING MATERIAL                               RUBBER
    INTERNAL MATERIAL                             STAINLESS STEEL, 1.5" PLASTIC SPHERES
    BOILER LOAD/SCRUBBER - %                         67.0
    FLUE GAS CAPACITY - CU.M/S                      164.4      ( 348400 ACFM)
    FLUE GAS TEMPERATURE - C                        146.1      (  295 F)
    L/G RATIO - LITER/CU.M                            7.5      (56.0 GAL/1000ACF)
    PRESSURE DROP - KPA                           *******      (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                    3.4      (   11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                   1.8      (    .80 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M                   .0      (  .020 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        97.0
    SO2 INLET CONCENTRATION - PPM                   500.000
    SO2 OUTLET CONCENTRATION - PPM                  420.000
    SO2 DESIGN REMOVAL EFFICIENCY - %                16.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
----------------------------------------------------------------------------------------------------

COMPANY NAME                                     PUBLIC SERVICE OF COLORADO
PLANT NAME                                       CHEROKEE
UNIT NUMBER                                      3
CITY                                             DENVER
STATE                                            COLORADO
REGULATORY CLASSIFICATION                        ******
PARTICULATE EMISSION LIMITATION - NG/J             43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                   ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                710.0
GROSS UNIT GENERATING CAPACITY - MW               170.0
NET UNIT GENERATING CAPACITY W/FGD - MW           150.0
NET UNIT GENERATING CAPACITY WO/FGD - MW          170.0
EQUIVALENT SCRUBBED CAPACITY - MW                 152.6

** BOILER DATA
    SUPPLIER                                     BABCOCK & WILCOX
    TYPE                                         PULVERIZED COAL
    SERVICE LOAD                                 ******
    COMMERCIAL SERVICE DATE                       0/62
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S          287.86       ( 610000 ACFM)
    FLUE GAS TEMPERATURE - C                      137.8         ( 280 F)
    STACK HEIGHT - M                             ******         (**** FT)
    STACK TOP DIAMETER - M                       *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                    23493.        ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                   ******
    AVERAGE ASH CONTENT - %                          12.50
    RANGE ASH CONTENT - %                        ******
    AVERAGE MOISTURE CONTENT - %                     11.30
    RANGE MOISTURE CONTENT - %                   ******
    AVERAGE SULFUR CONTENT - %                         .65
    RANGE SULFUR CONTENT - %                     ******
    AVERAGE CHLORIDE CONTENT - %                       .01
    RANGE CHLORIDE CONTENT - %                   ******

** ESP
    NUMBER                                         1

** MECHANICAL COLLECTOR
    NUMBER                                         1

** PARTICULATE SCRUBBER
    NUMBER                                         2
    TYPE                                         TCA
    SUPPLIER                                     AIR CORRECTION DIVISION, UOP
    NUMBER OF STAGES                                 3
    SHELL MATERIAL                               CARBON STEEL
    LINING MATERIAL                              RUBBER
    INTERNAL MATERIAL                            STAINLESS STEEL, PLASTIC SPHERES
    BOILER LOAD/SCRUBBER - %                        20.0
    FLUE GAS CAPACITY - CU.M/S                      57.6        ( 122000 ACFM)
    FLUE GAS TEMPERATURE - C                       137.8        (  280 F)
    L/G RATIO - LITER/CU.M                           7.5        (56.0 GAL/1000ACF)
    PRESSURE DROP - KPA                          *******        (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                   3.4        (    11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                   .9        (    .40 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M                  .0        (   .020 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %      95.0
    SO2 INLET CONCENTRATION - PPM                 500.000
    SO2 OUTLET CONCENTRATION - PPM                420.000
    SO2 DESIGN REMOVAL EFFICIENCY - %               16.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                        PUBLIC SERVICE OF COLORADO
PLANT NAME                                          CHEROKEE
UNIT NUMBER                                         4
CITY                                                DENVER
STATE                                               COLORADO
REGULATORY CLASSIFICATION                           ******
PARTICULATE EMISSION LIMITATION - NG/J                43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                      ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                   710.0
GROSS UNIT GENERATING CAPACITY - MW                  375.0
NET UNIT GENERATING CAPACITY W/FGD - MW              350.0
NET UNIT GENERATING CAPACITY WO/FGD - MW             375.0
EQUIVALENT SCRUBBED CAPACITY - MW                    356.4

** BOILER DATA
    SUPPLIER                                        COMBUSTION ENGINEERING
    TYPE                                            PULVERIZED COAL
    SERVICE LOAD                                    ******
    COMMERCIAL SERVICE DATE                          0/68
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S            717.29        (1520000 ACFM)
    FLUE GAS TEMPERATURE - C                         135.0         ( 275 F)
    STACK HEIGHT - M                                ******         (**** FT)
    STACK TOP DIAMETER - M                          *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       23493.        ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                     ******
    AVERAGE ASH CONTENT - %                            12.50
    RANGE ASH CONTENT - %                           ******
    AVERAGE MOISTURE CONTENT - %                       11.30
    RANGE MOISTURE CONTENT - %                      ******
    AVERAGE SULFUR CONTENT - %                           .65
    RANGE SULFUR CONTENT - %                        ******
    AVERAGE CHLORIDE CONTENT - %                         .01
    RANGE CHLORIDE CONTENT - %                      ******

** ESP
    NUMBER                                           1

** MECHANICAL COLLECTOR
    NUMBER                                           1

** PARTICULATE SCRUBBER
    NUMBER                                           4
    TYPE                                            TCA
    SUPPLIER                                        AIR CORRECTION DIVISION, UOP
    NUMBER OF STAGES                                    3
    SHELL MATERIAL                                  CARBON STEEL
    LINING MATERIAL                                 RUBBER
    INTERNAL MATERIAL                               STAINLESS STEEL, PLASTIC SPHERES
    L/G RATIO - LITER/CU.M                              7.5        (56.0 GAL/1000ACF)
    PRESSURE DROP - KPA                             *******        (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                      3.4        (   11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                     1.6        (    .70 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M                     .0        (  .020 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %         97.0
    SO2 INLET CONCENTRATION - PPM                    500.000
    SO2 OUTLET CONCENTRATION - PPM                   420.000
    SO2 DESIGN REMOVAL EFFICIENCY - %                 16.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                PUBLIC SERVICE OF COLORADO
PLANT NAME                                  VALMONT
UNIT NUMBER                                 5
CITY                                        VALMONT
STATE                                       COLORADO
REGULATORY CLASSIFICATION                   ******
PARTICULATE EMISSION LIMITATION - NG/J        43.         (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J              ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW           273.8
GROSS UNIT GENERATING CAPACITY - MW          166.0
NET UNIT GENERATING CAPACITY W/FGD - MW      163.0
NET UNIT GENERATING CAPACITY WO/FGD - MW      83.0
EQUIVALENT SCRUBBED CAPACITY - MW            166.0

** BOILER DATA
    SUPPLIER                                COMBUSTION ENGINEERING
    TYPE                                    PULVERIZED COAL
    SERVICE LOAD                            BASE
    COMMERCIAL SERVICE DATE                  0/64
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S     436.98      ( 926000 ACFM)
    FLUE GAS TEMPERATURE - C                  126.7       ( 260 F)
    STACK HEIGHT - M                        ******        (**** FT)
    STACK TOP DIAMETER - M                  *******       (***** FT)

** FUEL DATA
    FUEL TYPE                               COAL
    FUEL GRADE                              SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G               25121.       ( 10800 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                            ******
    AVERAGE ASH CONTENT - %                      6.00
    RANGE ASH CONTENT - %                   5.4-7.0
    AVERAGE MOISTURE CONTENT - %                15.00
    RANGE MOISTURE CONTENT - %              12.7-18.3
    AVERAGE SULFUR CONTENT - %                    .70
    RANGE SULFUR CONTENT - %                0.68-.73
    AVERAGE CHLORIDE CONTENT - %            ********
    RANGE CHLORIDE CONTENT - %              ******

** ESP
    NUMBER                                   1
    TYPE                                    COLD SIDE
    FLUE GAS CAPACITY - CU.M/S                218.5       ( 463000 ACFM)

** MECHANICAL COLLECTOR
    NUMBER                                   1
    FLUE GAS CAPACITY - CU.M/S                218.5       ( 463000 ACFM)

** PARTICULATE SCRUBBER
    NUMBER                                   2
    TYPE                                    TCA
    NUMBER OF STAGES                           3
    SHELL MATERIAL                          CARBON STEEL
    LINING MATERIAL                         RUBBER
    INTERNAL MATERIAL                       S.S.
    TYPE OF NOZZLES                         25.
    L/G RATIO - LITER/CU.M                       7.8      (58.3 GAL/1000ACF)
    PRESSURE DROP - KPA                     *******       (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S               3.4      (    11.0 FT/S)
```

```
                                            SECTION 14
                    DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS
------------------------------------------------------------------------------------------------------------

 COMPANY NAME                                         SOUTHWESTERN PUBLIC SERVICE
 PLANT NAME                                           HARRINGTON STATION
 UNIT NUMBER                                          1
 CITY                                                 AMARILLO
 STATE                                                TEXAS
 REGULATORY CLASSIFICATION                            ******
 PARTICULATE EMISSION LIMITATION - NG/J               ******          (****** LB/MMBTU)
 SO2 EMISSION LIMITATION - NG/J                       ******          (****** LB/MMBTU)
 NET PLANT GENERATING CAPACITY - MW                   *******
 GROSS UNIT GENERATING CAPACITY - MW                  *******
 NET UNIT GENERATING CAPACITY W/FGD - MW                350.0
 NET UNIT GENERATING CAPACITY WO/FGD - MW             *******
 EQUIVALENT SCRUBBED CAPACITY - MW                    *******

 ** BOILER DATA
     SUPPLIER                                         ******
     TYPE                                             ******
     SERVICE LOAD                                     ******
     COMMERCIAL SERVICE DATE                          **/**
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S            ********        (******* ACFM)
     FLUE GAS TEMPERATURE - C                         *******         (**** F)
     STACK HEIGHT - M                                 ******          (**** FT)
     STACK TOP DIAMETER - M                           *******         (***** FT)

 ** FUEL DATA
     FUEL TYPE                                        COAL
     FUEL GRADE                                       ******
     AVERAGE HEAT CONTENT - J/G                        19538.         (  8400 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                       ******
     AVERAGE ASH CONTENT - %                          ********
     RANGE ASH CONTENT - %                            ******
     AVERAGE MOISTURE CONTENT - %                     ********
     RANGE MOISTURE CONTENT - %                       ******
     AVERAGE SULFUR CONTENT - %                           .50
     RANGE SULFUR CONTENT - %                         ******
     AVERAGE CHLORIDE CONTENT - %                     ********
     RANGE CHLORIDE CONTENT - %                       ******

 ** ESP
     NUMBER                                           1
     TYPE                                             COLD SIDE
     SUPPLIER                                         RESEARCH COTTRELL
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          95.0

 ** PARTICULATE SCRUBBER
     TYPE                                             MARBLE BED
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.0
     SO2 INLET CONCENTRATION - PPM                     400.000
     SO2 DESIGN REMOVAL EFFICIENCY - %                  50.0
```

APPENDIX A

FGD SYSTEM COST DATA: OPERATIONAL AND NONOPERATIONAL SYSTEMS

INTRODUCTION

The cost of flue gas desulfurization (FGD) systems for the control of sulfur dioxide emissions is an area of intense interest and substantial controversy. As a result, many computer models have recently been developed to estimate capital and annual costs. As part of an effort by the U.S. Environmental Protection Agency to provide meaningful economic data concerning FGD systems, reported economic data have been incorporated into the EPA Utility FGD Survey report. This information has appeared as a separate appendix of the report since October 1976. Until January 1978, this cost appendix consisted entirely of data reported by the utilities with little or no interpretation provided by PEDCo Environmental, Inc. Beginning with the May 1978 report, the format and content of the cost appendix were revised to include reported and adjusted costs for the operational FGD systems.

The rationale for including adjusted as well as reported costs stems primarily from the lack of comparability of the reported costs. Many of the reported cost figures, both capital and operating, are largely site-sensitive values that cannot be accurately compared because they refer to different FGD battery limits and different years in which the expenditures were made. As a result, an analysis of the cost data was made for the operational units since these systems offer the potential of having complete and accurate economic data. The adjustments were made to provide comparable, accurate cost data for the sulfur dioxide portion of the emission control system. This, in effect, will eliminate much of the confusion that exists concerning the reported data, and it will provide a common basis for the reported costs.

In an attempt to promote further comparability of the figures, the adjustment procedure was carried one step further and standardized adjusted figures were developed. This was done by modifying the fixed annual cost rates such that they would be identical for each unit (i.e. cost of depreciation, interim replacement, taxes, insurance and capital costs). The newly adjusted total fixed annual cost rate was applied to the total adjusted capital cost in each case and a standardized adjusted annual cost was obtained.

APPROACH

In March 1978, each utility having at least one operational FGD system was given a cost form containing all available cost information then in the PEDCo files. The utility was asked to verify the data and fill in any missing information called for on the form. A follow-up visit by the PEDCo Environmental staff was arranged to assist in data acquisition and to insure completeness and reliability of information. Results of the cost analysis were forwarded to each participating utility for final review and comment.

The cost data were treated solely to establish the accurate costs for FGD systems, on a common basis, not to critique the design or reasonableness of the costs reported by any utility. Adjustments focused primarily on the following items:

- All capital costs were adjusted to July 1, 1977, dollars using the Chemical Engineering Index. All capital costs, represented in dollars/kilowatt ($/kW), were expressed in terms of gross megawatts (MW). Actual costs were reported by utilities in dollar values for years 1970 to 1980. These values are represented in terms of the year of greatest capital expenditures.

- Gross unit capacity was used to express all FGD capital expenditures because the capital requirement of an FGD system is dependent on actual boiler size before derating for auxiliary and air quality control power requirements.

- Particulate control costs were deducted. Since the purpose of the study was to estimate the incremental cost for sulfur dioxide control, particulate control costs were deducted using either data contained in the cost breakdowns or as a percentage of the total direct cost (capital and annual). The percentage reduction varied depending upon system design and operation.

- The capital costs associated with the modification or installation of equipment not part of the FGD system but needed for its proper functioning, were included (e.g. - stack lining, modification to existing ductwork or fans, etc.).

- Indirect charges were adjusted to provide adequate funds for engineering, field expenses, legal expenses, insurance, interest during construction, allowance for startup, taxes, and contingency.

- All annual costs, represented in mills/kilowatt-hour (mills/kWh), were expressed in terms of net megawatts (MW).

- Net unit capacity was used to express all FGD annual expenditures because the annual cost requirement of an FGD system is dependent on the actual amount of kilowatt-hours (kWh) produced by the unit after derating for auxiliary and air quality control power requirements.

- All annual costs were adjusted to a common capacity factor (65%).

- Replacement power costs were not included since only a few utilities reported such costs and these were presented using a variety of methods.

- Sludge disposal costs were adjusted to reflect the costs of sulfur dioxide waste disposal only (i.e., excluding fly ash disposal) and to provide for disposal over the anticipated lifetime of the FGD system. This latter correction was necessary since several utilities reported costs for sludge disposal capacity that would last only a fraction of the FGD system life. The adjustments were based on a land cost of $2000/acre with a sludge depth of 50 ft in a clay-lined pond (clay is assumed to be available at the site).

- A 30-year life was assumed for all process and economic considerations for all new systems that were installed for the life of the unit. A 20-year life was assumed for all process and economic considerations for retrofit systems that were installed for the remaining portion of the life of the unit.*

- Regeneration and by-product recovery facility costs were added for those regenerable systems not reporting such costs.

To the extent possible, all cost adjustments were made using the previous assumptions developed by PEDCo Environmental. When cost data were inadequate, adjustments were made using process design data in conjunction with the previous cost assumptions. In some cases, no adjustments were possible because of insufficient data.

---

* The use of a 30-year service life for new units coincides with the conclusion of the National Power Survey of the Federal Power Commission which recognized this value as reasonable for steam-electric plants. A 20-year service life was assumed for all retrofit units even if the remaining life of the units is less than this value. Thus, two different rates are used and should be noted when making comparisons between new and retrofit systems.

DESCRIPTION OF COST ELEMENTS

Capital costs consist of direct costs, indirect costs, contingency costs, and other capital costs. Direct costs include the "bought-out" cost of the equipment, the cost of installation, and site development. Indirect costs include interest during construction, contractor's fees and expenses, engineering, legal expenses, taxes, insurance, allowance for start-up and shakedown, and spares. Contingency costs include those costs resulting from malfunctions, equipment alterations, and similar unforeseen sources. Other capital costs include the nondepreciable items of land and working capital.

Annual costs consist of direct costs, fixed costs, and overhead costs. Direct costs include the cost of raw materials, utilities, operating labor and supervision, and maintenance and repairs. Fixed costs include those of depreciation, interim replacement, insurance, taxes, and interest on borrowed capital. Overhead costs include those of plant and payroll expenses. The various capital and annual cost components are discussed and defined in greater detail in the following paragraphs.

The direct capital costs include the following elements:

- Equipment required for the FGD system. Table A-1 provides a summary of the major process equipment used in regenerable and nonregenerable systems.
- Installation of equipment, including foundations; steel work for support, buildings, piping and ducting for effluents, slurries, sludge, and make-up water, control panels, instrumentation, insulation of ducting, buildings, piping, and other equipment, painting and piling.
- Site development may include clearing and grading, construction of access roads and walkways, establishment of rail, barge, and/or truck facilities, and parking facilities.

TABLE A-1. MAJOR FGD SYSTEM EQUIPMENT SUMMARY

Category	Description
Material handling-raw materials	Equipment for the handling and transfer of raw materials includes unloading facilities, conveyors, storage areas and silos, vibrators, atmospheric emission control associated with these facilities, and related accessories.
Feed preparation-raw materials	Equipment for the preparation of raw material to produce a feed slurry consists of feed weighers, crushers, grinders, classifiers, ball mills, mixing tanks, pumps, agitators, and related accessories.
Sulfur dioxide absorption	Equipment for treating the flue gas includes absorbers, mist eliminators, hold tanks, agitators, circulating pumps, pond water return pumps, and related accessories.
Flue gas reheat	Equipment required includes air, steam, or hot water heaters, condensate tanks, pumps, soot blowers, fans, fuel storage facilities, gas bypass equipment, and related accessories.
Gas handling	Equipment to handle the boiler flue gas includes booster fans, ductwork, flue gas bypass system, turning vanes, supports, platforms, and related accessories.
Sludge disposal	Nonregenerable FGD systems require solids/water separation equipment such as clarifiers, vacuum filters, centrifuges, sludge fixation equipment, and related accessories.
Utilities	Equipment to supply power and water to the FGD equipment consists of switch-gear, breakers, transformers, piping, and related accessories.
By-product handling	Equipment for processing the by-product of regenerable FGD systems may include a rotary kiln, fluid bed dryer, conveyor, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boilers, hammer mills, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.

(continued)

TABLE A-1. (continued)

Category	Description
Regeneration	Equipment for regeneration of the absorbing medium of an FGD system may consist of reactor vessels, material handling system, storage, weigh feeder, conveyor, rotary kiln, fluid bed calciner, dust collector, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boiler, hammer mill, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.
Purge treatment	Equipment for the removal of purge material (e.g. sodium sulfate) includes refrigeration, pumps, tanks, crystallizer, centrifuge, dryer, dust collector, conveyors, storage, and related equipment.
Auxiliary	Equipment not directly related to the FGD system, but which may require design or modification to accommodate an FGD system may include such items as existing fans, ducts, or stack. If new fans, ducts, or stacks are added to improve boiler performance and accommodate the FGD system, the costs are prorated to the boiler and FGD system.

Indirect capital costs include the following elements:

- Interest accrued on borrowed capital during construction.
- Contractor's fee and expenses, including costs for field labor payroll; field office supervision; personnel; construction offices; temporary roadways; railroad trackage; maintenance and welding shops; parking lot; communications; temporary piping and electrical and sanitary facilities; safety security (fire, material, medical, etc.); construction tools and rental equipment; unloading and storage of materials; travel expenses; permits; licenses; taxes; insurance; overhead; legal liabilities; field testing of equipment; start-up; and labor relations.
- Engineering costs, including administrative, process, project, and general; design and related functions for specifications; bid analysis; special studies; cost analysis; accounting; reports; consultant fees; purchasing; procurement; travel expenses; living expenses; expediting; inspection; safety; communications; modeling; pilot plant studies (if required because of process design or application novelty); royalty payments during construction; training of plant personnel; field engineering; safety engineering; and consultant services.
- Legal expenses, including those for securing permits, rights-of-way, etc.
- Taxes, including sales, and excise taxes.
- Insurance covering liability for equipment in transit and at site; fire, casualty, injury, and death; damage to property; delay; and noncompliance.
- Allowance for start-up and shakedown includes the cost associated with system start-up.
- Spare parts including pumps, valves, controls, special piping and fittings, instruments, spray nozzles, and similar items.

Other capital costs include the following elements:

- Land required for the FGD process, waste disposal, regeneration facility, and storage.
- Working capital, including the total amount of money invested in raw materials and supplies in stock, finished products in stock, and unfinished products

in the process of being manufactured; accounts receivable; cash kept on hand for payment of operating expenses such as salaries, wages, and raw materials purchases; accounts payable; and taxes payable.

Annual cost of an FGD system includes the following direct, fixed and overhead charges:

° Direct Charges

- Raw materials, including those required by the FGD process for sulfur dioxide control, absorbent regeneration, sludge treatment, sludge fixation, flocculants, etc.

- Utilities, including water for slurries, cooling and cleaning; electricity for pumps, fans, valves, lighting controls, conveyors, and mixers; fuel for reheating of flue gases; and stream for processing.

- Operating labor, including supervisory, skilled, and unskilled labor required to operate, monitor, and control the FGD process.

- Maintenance and repairs, consisting of both manpower and materials to keep the unit operating efficiently. The function of maintenance is both preventive and corrective to keep outages to a minimum.

- Byproduct Sales: credit from the sale of byproducts regenerable FGD processes (e.g. sulfur, sulfuric acid) is a negative charge deducted from the annual direct cost to obtain the net annual direct cost of the FGD system.

° Fixed Charges

- Depreciation - the annual charge to recover direct and indirect costs of physical assets over the life of the asset.

- Interim, replacement - costs expended for temporary or provisional replacement of equipment that has failed or malfunctioned prematurely.

- Insurance, including the costs of protection from loss by a specified contingency, peril, or unforeseen event. Required coverage could include losses due to fire, personal injury or death, property damage, explosion, lightning, or other natural phenomena.

- Taxes, including franchise, excise, and property taxes levied by a city, county, state, or Federal government.

- Interest on borrowed funds.

° Overhead

Plant and administrative overhead is a business expense that is not charged directly to a particular part of a project, but is allocated to it. Overhead costs include administrative, safety, engineering, legal and medical services; payroll; employee benefits; recreation; and public relations.

Table A-2 provides a summary of the means used to determine the missing cost elements if the costs were not reported or insufficient information prevented their actual determination. The assumptions and cost bases for determining the capital and annual costs of FGD systems were developed by the PEDCo staff based upon previous economic studies conducted for the U.S. EPA (Flue Gas Desulfurization Process Cost Assessment, May 1975; Simplified Procedures for Estimating Flue Gas Desulfurization System Costs, June 1976, EPA-600/2-76-150; Particulate and Sulfur Dioxide Emission Control Costs for Large Coal-Fired Boilers, March 1978, EPA-600/7-78-032).

TABLE A-2. COST ELEMENT FACTORS

Category	Value
Indirect capital costs:	
Interest during construction	10% of total direct capital costs
Field overhead	10% of total direct capital costs
Contractor's fee and expenses	5% of total direct capital costs
Engineering	10% of total direct capital costs
Taxes	2% of total direct capital costs
Spares	1% of total direct capital costs
Shakedown allowance	5% of total direct capital costs
Other capital costs:	
Contingency[a]	20% of total direct and indirect capital costs
Direct annual costs:	
Raw materials:	
Fixation chemicals	\$2/ton
Lime	\$40/ton
Limestone	\$10/ton
Magnesium oxide	\$150/ton
Sodium carbonate	\$80/ton
Salt cake (credit)	\$50/ton
Sulfur (credit)	\$65/ton
Sulfuric acid (credit)	\$25/ton
Utilities:	
Electricity	25 mills/kWh
Water	\$0.20/10^3 gal
Steam	\$0.80/10^6 Btu
Operating labor:	
Direct labor	\$8.50/man-hour
Supervision	15% of direct labor costs

[a] Contingency costs are used only when the cost data supplied are incomplete (such as equipment costs or direct costs only) and a contingency cost must be factored in to give an accurate estimate of the total capital cost.

(continued)

TABLE A-2. (continued)

Category	Value
Maintenance:	
Labor and materials	4% of total direct capital costs
Supplies	15% of labor and materials costs
Overhead:	
Plant	50% of operation and maintenance costs
Payroll	20% of operating labor costs
Fixed annual costs:	
Depreciation	3.33% or 5% (new or retrofit)
Interim replacement[b]	0.7% or 0.35%
Taxes	4%
Insurance	0.3%
Capital costs	9%

[b] Some system components have life spans less than the expected service life of the system. Interim replacement is an allowance factor used in estimating annual revenue requirements to provide for the replacement of these short-lived items. An average allowance of 0.35% of the total investment is normally provided and used for systems with an expected service life of 20 years or less. A higher allowance of 0.70% of the total investment is provided and used for systems with an expected service life of 30 years or more.

DEFINITION OF COST ELEMENTS

The costs displayed in Appendix A are accompanied by a series of alphabetic characters summarizing data presented for each FGD system. These relate to the cost elements described earlier in this section and identify what has been included and excluded for reported and adjusted capital and annual costs. The alphabetic characters, along with their titles, are briefly described in Table A-3.

TABLE A-3. DESCRIPTION OF COST

Code	Title	Description
A	Particulate control (required for FGD process) included in capital cost.	Particulate precollection device (ESP, fabric filter, venturi) prior to FGD system required for proper operation of SO_2 control system.
B	Particulate control (included in FGD process) included in capital cost.	Particulate collection equipment (venturi scrubber) is included in the FGD system.
C	Total direct capital costs included.	Complete cost of all FGD equipment, the labor and materials required for equipment installation, and interconnecting the system is included in the total capital cost.
D	Partial direct capital costs included.	One or a number of direct cost items, or the cost associated with one or a number of direct cost items, are excluded from the total capital cost.
E	Total indirect capital costs included.	Complete cost of all the indirect cost elements, including interest during construction, contractor's fees, engineering, legal expenses, taxes, insurance, allowance for start-up, and spares, is included in total capital cost.
F	Partial indirect costs included.	One or a number of indirect cost items, or the cost associated with one or a number of indirect cost items, are excluded from the total capital cost.
G	Chemical fixation of sludge included in capital cost.	The cost of a chemical fixation process which stabilizes the flue gas cleaning wastes prior to disposal is included in the total capital cost.
H	Dry sludge disposal included in capital cost.	The cost of a secondary dewatering or treatment method, such as filtration, centrifugation, or forced oxidation, which ultimately produces a dry sludge cake for final disposal, is included in the total capital cost.
I	Off-site landfill area included in capital cost.	The cost of an off-site area used as a landfill for flue gas cleaning wastes is included in the total capital cost.
J	Sludge pond included in capital cost.	The cost of an on-site disposal area for ponding of treated or untreated flue gas cleaning wastes is included in the total capital cost.
K	Additional sludge disposal capacity added for life of system.	The cost of additional SO_2 waste disposal capacity required for FGD system operation over the anticipated service life of the unit is included in the total capital cost.
L	Stack included in capital cost.	The cost of the stack is included in the total capital cost.
M	Modifications to stack, ducts, and/or fans included in capital cost.	Modifications to existing equipment (stack, fans, ducts, etc.) which are required because of inclusion of an FGD system.
N	Total regeneration facility cost included in capital cost.	Complete cost of entire regeneration facility included in total capital cost.
O	Partial regeneration facility cost included in capital cost.	Part of the cost associated with the regeneration facility included in the total capital cost.
P	R & D costs included in capital cost.	Bench scale or pilot plant studies to determine process and design characteristics.

(continued)

TABLE A-3. (continued)

Code	Title	Description
Q	Costs underwritten by system supplier included in capital cost.	Capital expenditures underwritten by the system supplier for system repairs or modifications for optimization of performance or R & D programs.
R	Excess reagent supply costs included in capital cost.	Capital expenditures for reagent supply exceeds the amount required for the period of initial operation.
S	Total direct annual costs included.	Complete cost of all raw materials, utilities, operating labor and maintenance and repairs is included in the total annual cost.
T	Partial direct annual costs included.	One or a number of direct annual cost items, or the cost associated with one or a number of direct annual cost items, are excluded from the total annual cost.
U	Total fixed annual costs included.	Complete cost of all fixed cost elements, including depreciation, interim replacement, insurance, taxes, and interest, is included in the total annual cost.
V	Partial fixed annual costs included.	One or a number of fixed annual cost items, or the cost associated with one or a number of fixed annual cost items, are excluded from the total annual cost.
W	Overhead cost included in total annual cost.	Plant and payroll overhead costs are included in the total annual cost.
X	Particulate control costs included in direct annual cost.	The cost of operating particulate collection equipment included in the FGD system is included in the total annual cost.
Y	Sludge disposal service costs (contract) included in direct annual cost.	The treatment and disposal of flue gas cleaning wastes that are handled by an outside firm.
Z	Replacement energy costs included in total annual costs.	The cost of additional power-generating capacity required to compensate for power used by the FGD system.

RESULTS OF COST ANALYSIS

The results of the operational FGD system survey are summarized in Table A-4 and Section A-1. Table A-4 produces a summary of a categorical analysis of the reported and adjusted capital and annual costs for the operational FGD systems addressed in the survey. Included in this categorical analysis are the ranges, means, and standard deviation for all the various types and categories of FGD systems examined. Section A-1 summarizes the reported and adjusted capital and annual costs for all the operational FGD systems that were addressed in the cost study (Section A-2 summarizes available cost data for nonoperational FGD systems).

TABLE A-4. CATEGORICAL RESULTS OF THE REPORTED AND ADJUSTED CAPITAL AND ANNUAL COSTS FOR OPERATIONAL FGD SYSTEMS

CATEGORY	REPORTED						ADJUSTED					
	CAPITAL, $/KW			ANNUAL, MILLS/KWH			CAPITAL, $/KW			ANNUAL, MILLS/KWH		
	RANGE	AVG	DEV	RANGE	AVG	DEV	RANGE	AVG	DEV	RANGE	AVG	DEV
ALL	29.2-232.5	90.3	52.4	.3- 14.9	5.4	4.7	60.9-233.2	94.2	35.2	2.7- 12.4	5.5	2.4
NEW	31.0-232.5	94.0	58.1	.3- 14.3	4.1	4.5	66.4-117.6	85.5	16.9	2.8- 8.7	5.2	2.0
RETROFIT	29.2-156.9	83.9	41.9	2.1- 14.9	7.3	4.5	60.9-233.2	103.6	45.8	2.7- 12.4	5.8	2.6
THROWAWAY PRODUCT	29.2-232.5	84.3	51.8	.3- 14.3	5.0	4.4	60.9-140.6	87.0	21.2	2.7- 8.7	5.2	1.9
SALEABLE PRODUCT	127.9-156.9	142.3	14.5	14.9- 14.9	14.9	.0	134.8-233.2	184.0	49.2	12.4- 12.4	12.4	.0
LIMESTONE	31.0-232.5	103.7	67.9	1.3- 3.3	2.2	.7	66.4-117.6	93.1	21.9	2.9- 6.6	5.0	1.4
DUAL ALKALI	43.2-189.0	96.7	65.5	3.2- 3.2	3.2	.0	*****- .0	.0	.0	*****- .0	.0	.0
LIME	29.2-120.6	73.6	32.1	5.8- 14.3	9.7	3.4	67.5-140.6	90.8	22.2	2.7- 8.7	6.4	2.0
LIME/ALKALINE FLYASH	77.1- 85.9	80.0	4.1	.3- .3	.3	.0	77.2- 93.0	82.5	7.4	4.1- 5.2	4.5	.5
SODIUM CARBONATE	42.9-113.6	66.5	33.3	2.1- 2.1	2.1	.0	60.9-107.9	76.6	22.2	3.2- 4.4	3.6	.6
WELLMAN LORD	127.9-156.9	137.6	13.7	14.9- 14.9	14.9	.0	134.8-134.8	134.8	.0	12.4- 12.4	12.4	.0
LIMESTONE/ALKALINE FLYASH	47.9- 47.9	47.9	.0	2.0- 2.0	2.0	.0	71.5- 71.5	71.5	.0	2.8- 2.8	2.8	.0
MAGNESIUM OXIDE	156.7-156.7	156.7	.0	*****- .0	.0	.0	233.2-233.2	233.2	.0	*****- .0	.0	.0

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	COST ADJUSTED	COST STANDARDIZED ADJUSTED
ALABAMA ELECTRIC COOP	CAPACITY FACTOR, %	***	65	65
TOMBIGBEE	TOTAL CAPITAL, $/KW(YEAR)	172.5(1978)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
179.0 MW (NET)	COST ELEMENTS	A,D		
ALABAMA ELECTRIC COOP	CAPACITY FACTOR, %	***	65	65
TOMBIGBEE	TOTAL CAPITAL, $/KW(YEAR)	69.5(1978)	******(0)	******(0)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
179.0 MW (NET)	COST ELEMENTS	C,E,J		
ARIZONA ELECTRIC POWER COOP	CAPACITY FACTOR, %	44	65	65
APACHE	TOTAL CAPITAL, $/KW(YEAR)	35.9(1977)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.1(1978)	******(0)	******(0)
195.0 MW (NET)	COST ELEMENTS	C,E,H,J,L,S, U,W,Y,Z		
ARIZONA ELECTRIC POWER COOP	CAPACITY FACTOR, %	44	65	65
APACHE	TOTAL CAPITAL, $/KW(YEAR)	31.8(7700)	******(0)	******(0)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.1(1978)	******(0)	******(0)
195.0 MW (NET)	COST ELEMENTS	C,E,H,J,L,S, U,W,Y,Z		
CENTRAL ILLINOIS LIGHT	CAPACITY FACTOR, %	***	65	65
DUCK CREEK	TOTAL CAPITAL, $/KW(YEAR)	93.3(1978)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	3.3(1976)	******(0)	******(0)
378.0 MW (NET)	COST ELEMENTS	C,E,J,M		
CENTRAL ILLINOIS PUBLIC SERV	CAPACITY FACTOR, %	***	65	65
NEWTON	TOTAL CAPITAL, $/KW(YEAR)	189.0(1979)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
617.0 MW (NET)	COST ELEMENTS	C,E,G		
COLUMBUS & SOUTHERN OHIO ELEC.	CAPACITY FACTOR, %	48	65	65
CONESVILLE	TOTAL CAPITAL, $/KW(YEAR)	55.5(1975)	70.7(1977)	70.7(1977)
5	TOTAL ANNUAL, MILLS/KWH(YEAR)	5.8(1978)	7.4(1977)	7.4(1977)
411.0 MW (NET)	COST ELEMENTS	B,C,J,M,S,U, W,X,Y	C,E,J,M,S,U, W,Y	C,E,J,M,S,U, W,Y
COLUMBUS & SOUTHERN OHIO ELEC.	CAPACITY FACTOR, %	48	65	65
CONESVILLE	TOTAL CAPITAL, $/KW(YEAR)	55.5(1978)	70.7(1977)	******(0)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	5.8(1978)	******(0)	******(0)
411.0 MW (NET)	COST ELEMENTS	B,C,J,M,S,U, W,X,Y	C,E,J,M,S,U, W,Y	
DUQUESNE LIGHT	CAPACITY FACTOR, %	64	65	65
ELRAMA	TOTAL CAPITAL, $/KW(YEAR)	113.4(1976)	127.1(1977)	127.1(1977)
1-4	TOTAL ANNUAL, MILLS/KWH(YEAR)	8.6(1977)	7.8(1977)	7.5(1977)
510.0 MW (NET)	COST ELEMENTS	B,D,F,I,J,M, T,V,X,Y	C,E,I,J,M,S, U,Y	C,E,I,J,M,S, U,Y
DUQUESNE LIGHT	CAPACITY FACTOR, %	70	65	65
PHILLIPS	TOTAL CAPITAL, $/KW(YEAR)	106.9(1972)	140.6(1977)	140.6(1977)
1-6	TOTAL ANNUAL, MILLS/KWH(YEAR)	7.8(1977)	8.6(1977)	8.2(1977)
410.0 MW (NET)	COST ELEMENTS	B,D,F,I,J,M, T,V,X,Y	C,E,I,J,M,S, U,Y	C,E,I,J,M,S, U,Y

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
INDIANAPOLIS POWER & LIGHT PETERSBURG 3 532.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 99.5(1976) ******(0) C,F,G,J,M	65 100.6(1977) 6.6(1977) C,E,G,J,M,S,U,W,Y	65 100.6(1977) 7.4(1977) C,E,G,J,M,S,U,W,Y
KANSAS CITY POWER & LIGHT HAWTHORN 3 90.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	14 29.2(1972) 8.4(1977) B,D,F,T,X	65 87.2(1977) 4.3(1977) B,C,E,J,K,S,U,W,X	65 87.2(1977) 4.4(1977) B,C,E,J,K,S,U,W,X
KANSAS CITY POWER & LIGHT HAWTHORN 4 90.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 29.2(1972) 8.4(1977) B,D,F,T,X	65 87.2(1977) 4.3(1977) B,C,E,J,K,S,U,W,X	65 87.2(1977) 4.4(1977) B,C,E,J,K,S,U,W,X
KANSAS CITY POWER & LIGHT LA CYGNE 1 874.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	42 53.6(1972) 1.3(1978) T	65 68.0(1977) 3.8(1977) C,E,J,K,S,U	65 68.0(1977) 3.9(1977) C,E,J,K,S,U
KENTUCKY UTILITIES GREEN RIVER 1-3 64.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	16 70.3(1975) 14.3(1977) B,C,E,J,S,U,W	65 77.5(1977) 2.7(1977) C,E,J,S,U,W	65 77.5(1977) 5.2(1977) C,E,J,S,U,W
LOUISVILLE GAS & ELECTRIC CANE RUN 4 188.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	55 66.5(1975) ******(1977) C,E,H,J,Q,T	65 80.6(1977) 5.8(1977) C,E,H,J,K,Q,S,U,W	65 80.6(1977) 6.2(1977) C,E,H,J,K,Q,S,U,W
LOUISVILLE GAS & ELECTRIC CANE RUN 5 190.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 62.4(1977) ******(0) C,E,H,J	65 67.5(1977) 5.6(1977) C,E,H,J,K,S,U,W	65 67.5(1977) 5.6(1977) C,E,H,J,K,S,U,W
LOUISVILLE GAS & ELECTRIC CANE RUN 6 288.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 57.9(1977) 3.2(1979) C,E,H,M,S,V,W	65 ******(0) ******(0)	65 ******(0) ******(0)
LOUISVILLE GAS & ELECTRIC PADDY'S RUN 6 72.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 52.8(1973) ******(0) C,E	65 76.4(1977) 6.5(1977) C,E,S,U,W	65 76.4(1977) 6.4(1977) C.E.S.U.W
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG 2 405.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 85.9(1976) ******(0) C,E,H,P	65 93.0(1977) 5.2(1977) C,E,H,M,P,S,U,W	65 93.0(1977) 5.2(1977) C.E.H.M.P.S.U.W

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
MONTANA POWER COLSTRIP 1 360.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	76 77.1(1975) .3(1977) B,C,E,J,P,T	65 77.2(1977) 4.1(1977) C,E,J,K,P,S,U,W	65 77.2(1977) 4.0(1977) C,E,J,K,P,S,U,W
MONTANA POWER COLSTRIP 2 360.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	76 77.1(1975) .3(1977) B,C,E,J,P,T	65 77.2(1977) 4.1(1977) C,E,J,K,P,S,U,W	65 77.2(1977) 4.1(1977) C,E,J,K,P,S,U,W
NEVADA POWER REID GARDNER 1 125.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	67 42.9(1973) 2.1(1977) B,D,E,P,S,U,W,X	65 60.9(1977) 3.2(1977) B,D,E,P,S,U,W,X	65 60.9(1977) 3.4(1977) B,D,E,P,S,U,W,X
NEVADA POWER REID GARDNER 2 125.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	67 42.9(1973) 2.1(1977) B,D,E,P,S,U,W,X	65 60.9(1977) 3.2(1977) B,D,E,P,S,U,W,X	65 60.9(1977) 3.4(1977) B,D,E,P,S,U,W,X
NEVADA POWER REID GARDNER 3 125.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	67 113.6(1975) 2.1(1977) B,C,E,L,S,U,W,X	65 107.9(1977) 4.4(1977) B,C,E,L,S,U,W,X	65 107.9(1977) 5.0(1977) B,C,E,L,S,U,W,X
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL 11 115.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	77 156.9(1976) 14.9(1976) B,C,E,L,N,S,U,W,X,Z	65 134.8(1977) 12.4(1977) C,E,L,N,S,U,W,Z	65 134.8(1977) 11.0(1977) C,E,L,N,S,U,W,Z
NORTHERN STATES POWER SHERBURNE 1 740.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	73 47.9(1972) 2.0(1977) B,C,J,S,U,X,Z	65 71.5(1977) 2.8(1977) C,E,J,K,S,U,W	65 71.5(1977) 3.3(1977) C,E,J,K,S,U,W
NORTHERN STATES POWER SHERBURNE 2 740.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	73 47.9(1972) 2.0(1977) B,C,J,S,U,X,Z	65 71.5(1977) 2.8(1977) C,E,J,K,S,U,W	65 71.5(1977) 3.3(1977) C,E,J,K,S,U,W
PENNSYLVANIA POWER BRUCE MANSFIELD 1 917.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	40 120.6(1975) 14.3(1977) B,C,E,G,I,L,S,U,W,X	65 102.1(1977) 8.7(1977) C,E,G,I,M,S,U,W	65 102.1(1977) 10.8(1977) C,E,G,I,M,S,U,W
PENNSYLVANIA POWER BRUCE MANSFIELD 2 917.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, $/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	40 120.6(1975) 14.3(1977) B,C,E,G,I,L,S,U,W,X	65 102.1(1977) 8.7(1977) C,E,G,I,M,S,U,W	65 102.1(1977) 10.8(1977) C,E,G,I,M,S,U,W

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
PHILADELPHIA ELECTRIC	CAPACITY FACTOR, %	***	65	65
EDDYSTONE	TOTAL CAPITAL, $/KW(YEAR)	156.7(1972)	233.2(1977)	233.2(1977)
1A	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(1972)	******(1977)	******(1977)
120.0 MW (NET)	COST ELEMENTS	D,F,N,P	C,E,N,P	C,E,N,P
PUBLIC SERVICE OF NEW MEXICO	CAPACITY FACTOR, %	***	65	65
SAN JUAN	TOTAL CAPITAL, $/KW(YEAR)	127.9(1977)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
361.0 MW (NET)	COST ELEMENTS	A,C,E,N		
PUBLIC SERVICE OF NEW MEXICO	CAPACITY FACTOR, %	***	65	65
SAN JUAN	TOTAL CAPITAL, $/KW(YEAR)	127.9(1977)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
350.0 MW (NET)	COST ELEMENTS	A,C,E,N		
SOUTH CAROLINA PUBLIC SERVICE	CAPACITY FACTOR, %	80	65	65
WINYAH	TOTAL CAPITAL, $/KW(YEAR)	47.4(1976)	66.4(1977)	6.4(1977)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	1.6(0)	2.9(1977)	3.2(1977)
140.0 MW (NET)	COST ELEMENTS	C,F,J,M,S,V	C,E,J,K,M,S, U,W	C,E,J,K,M,S, U,W
SOUTH MISSISSIPPI ELEC PWR	CAPACITY FACTOR, %	***	65	65
R.D. MORROW	TOTAL CAPITAL, $/KW(YEAR)	232.5(1978)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
124.0 MW (NET)	COST ELEMENTS	E		
SOUTH MISSISSIPPI ELEC PWR	CAPACITY FACTOR, %	***	65	65
R.D. MORROW	TOTAL CAPITAL, $/KW(YEAR)	232.5(1978)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
124.0 MW (NET)	COST ELEMENTS	D		
SOUTHERN INDIANA GAS & ELEC	CAPACITY FACTOR, %	***	65	65
A.B. BROWN	TOTAL CAPITAL, $/KW(YEAR)	43.2(1979)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
265.0 MW (NET)	COST ELEMENTS	C,E,G		
SPRINGFIELD CITY UTILITIES	CAPACITY FACTOR, %	***	65	65
SOUTHWEST	TOTAL CAPITAL, $/KW(YEAR)	77.3(1974)	117.6(1977)	117.6(1977)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	6.2(1977)	6.9(1977)
194.0 MW (NET)	COST ELEMENTS	C,F,H,J,P	C,E,H,J,K,P, S,U,W	C,E,H,J,K,P, S,U,W
TENNESSEE VALLEY AUTHORITY	CAPACITY FACTOR, %	60	65	65
WIDOWS CREEK	TOTAL CAPITAL, $/KW(YEAR)	98.1(1976)	113.1(1977)	113.1(1977)
8	TOTAL ANNUAL, MILLS/KWH(YEAR)	3.0(1977)	5.3(1977)	5.1(1977)
550.0 MW (NET)	COST ELEMENTS	B,C,E,P,R,T, U	C,E,J,S,U,W	C,E,J,S,U,W

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	***	65	65
LARAMIE RIVER	TOTAL CAPITAL, $/KW(YEAR)	68.2(1980)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
600.0 MW (NET)	COST ELEMENTS	C,E		
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	***	65	65
LARAMIE RIVER	TOTAL CAPITAL, $/KW(YEAR)	68.2(1980)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
600.0 MW (NET)	COST ELEMENTS	C,E		
BIG RIVERS ELECTRIC	CAPACITY FACTOR, %	***	65	65
GREEN	TOTAL CAPITAL, $/KW(YEAR)	43.2(1976)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
242.0 MW (NET)	COST ELEMENTS	B,C		
BOSTON EDISON	CAPACITY FACTOR, %	***	65	65
MYSTIC	TOTAL CAPITAL, $/KW(YEAR)	63.4(1972)	******(0)	******(0)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	3.0(1974)	******(0)	******(0)
150.0 MW (NET)	COST ELEMENTS	B,C,E,N,Q		
COLORADO UTE ELECTRIC ASSN.	CAPACITY FACTOR, %	***	65	65
CRAIG	TOTAL CAPITAL, $/KW(YEAR)	117.0(1979)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
447.0 MW (NET)	COST ELEMENTS	B,D,E		
COLORADO UTE ELECTRIC ASSN.	CAPACITY FACTOR, %	***	65	65
CRAIG	TOTAL CAPITAL, $/KW(YEAR)	117.0(1979)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
447.0 MW (NET)	COST ELEMENTS	A,C		
COMMONWEALTH EDISON	CAPACITY FACTOR, %	***	65	65
POWERTON	TOTAL CAPITAL, $/KW(YEAR)	117.7(1979)	******(0)	******(0)
51	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
450.0 MW (NET)	COST ELEMENTS	C,E,H,J		
COMMONWEALTH EDISON	CAPACITY FACTOR, %	49	65	65
WILL COUNTY	TOTAL CAPITAL, $/KW(YEAR)	113.0(1972)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	13.1(1975)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	B,C,E,G,J,X		
DETROIT EDISON	CAPACITY FACTOR, %	***	65	65
ST. CLAIR	TOTAL CAPITAL, $/KW(YEAR)	80.3(1976)	******(0)	******(0)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	9.6(1976)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	B,C,E,J,M,X		
ILLINOIS POWER COMPANY	CAPACITY FACTOR, %	***	65	65
WOOD RIVER	TOTAL CAPITAL, $/KW(YEAR)	82.5(1972)	******(0)	******(0)
4	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
110.0 MW (NET)	COST ELEMENTS	A,C,E,M,N		

****** INDICATES COST FIGURES NOT YET AVAILABLE

EPA UTILITY FGD SURVEY: THIRD QUARTER 1979

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
PACIFIC POWER & LIGHT	CAPACITY FACTOR, %	***	65	65
JIM BRIDGER	TOTAL CAPITAL, $/KW(YEAR)	120.0(1979)	******(0)	******(0)
4	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
550.0 MW (NET)	COST ELEMENTS	C,E,J		
POTOMAC ELECTRIC POWER	CAPACITY FACTOR, %	***	65	65
DICKERSON	TOTAL CAPITAL, $/KW(YEAR)	68.0(1978)	******(0)	******(0)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
[illegible].0 MW (NET)	COST ELEMENTS	A,C,E,M		
PUBLIC SERVICE OF COLORADO	CAPACITY FACTOR, %	***	65	65
VALMONT	TOTAL CAPITAL, $/KW(YEAR)	87.0(1974)	******(0)	******(0)
5	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
166.0 MW (NET)	COST ELEMENTS	B,C,E,J		
SALT RIVER PROJECT	CAPACITY FACTOR, %	***	65	65
CORONADO	TOTAL CAPITAL, $/KW(YEAR)	98.0(1978)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
280.0 MW (NET)	COST ELEMENTS	C,E		
SALT RIVER PROJECT	CAPACITY FACTOR, %	***	65	65
CORONADO	TOTAL CAPITAL, $/KW(YEAR)	98.0(1978)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
280.0 MW (NET)	COST ELEMENTS	C,E		

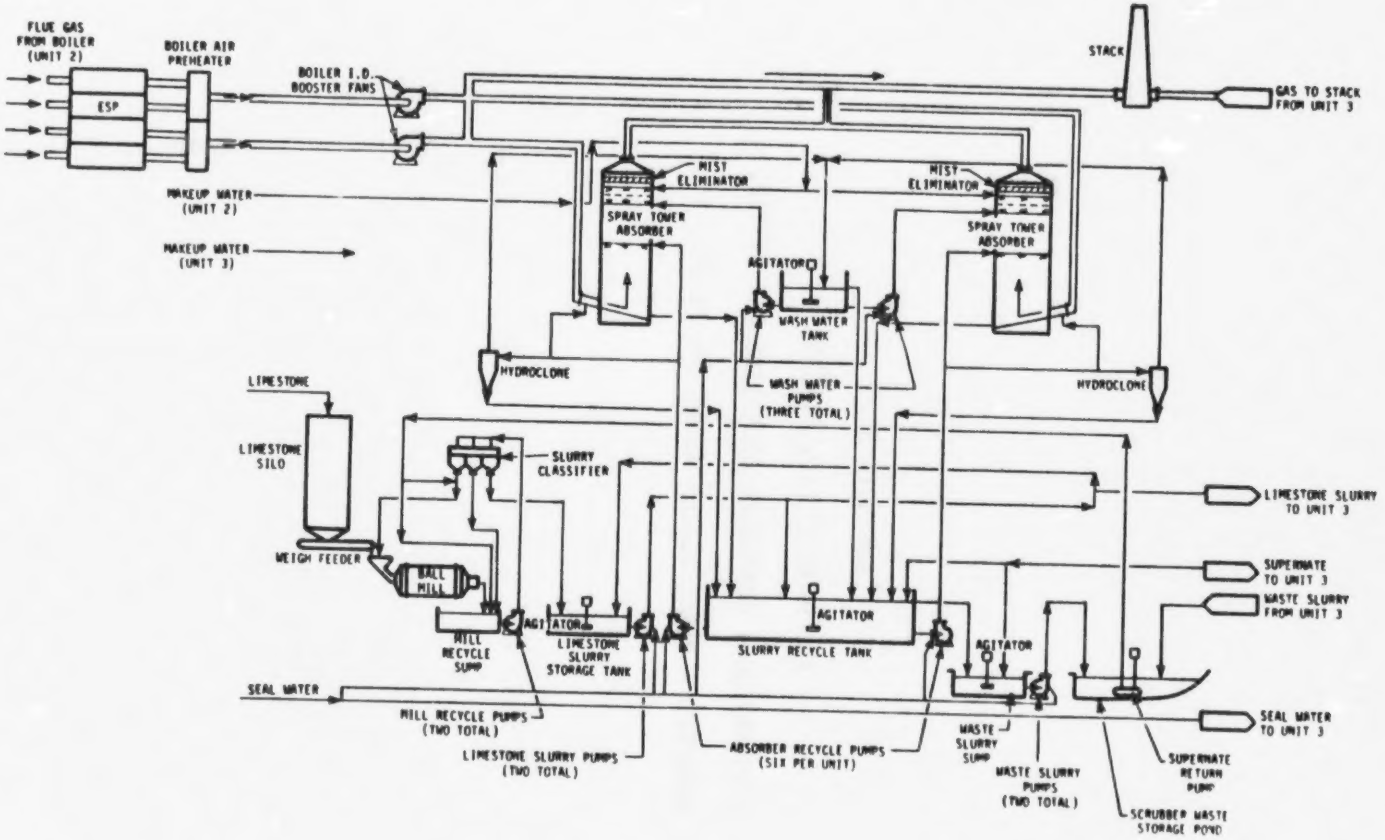
Reproduced from best available copy.

****** INDICATES COST FIGURES NOT YET AVAILABLE

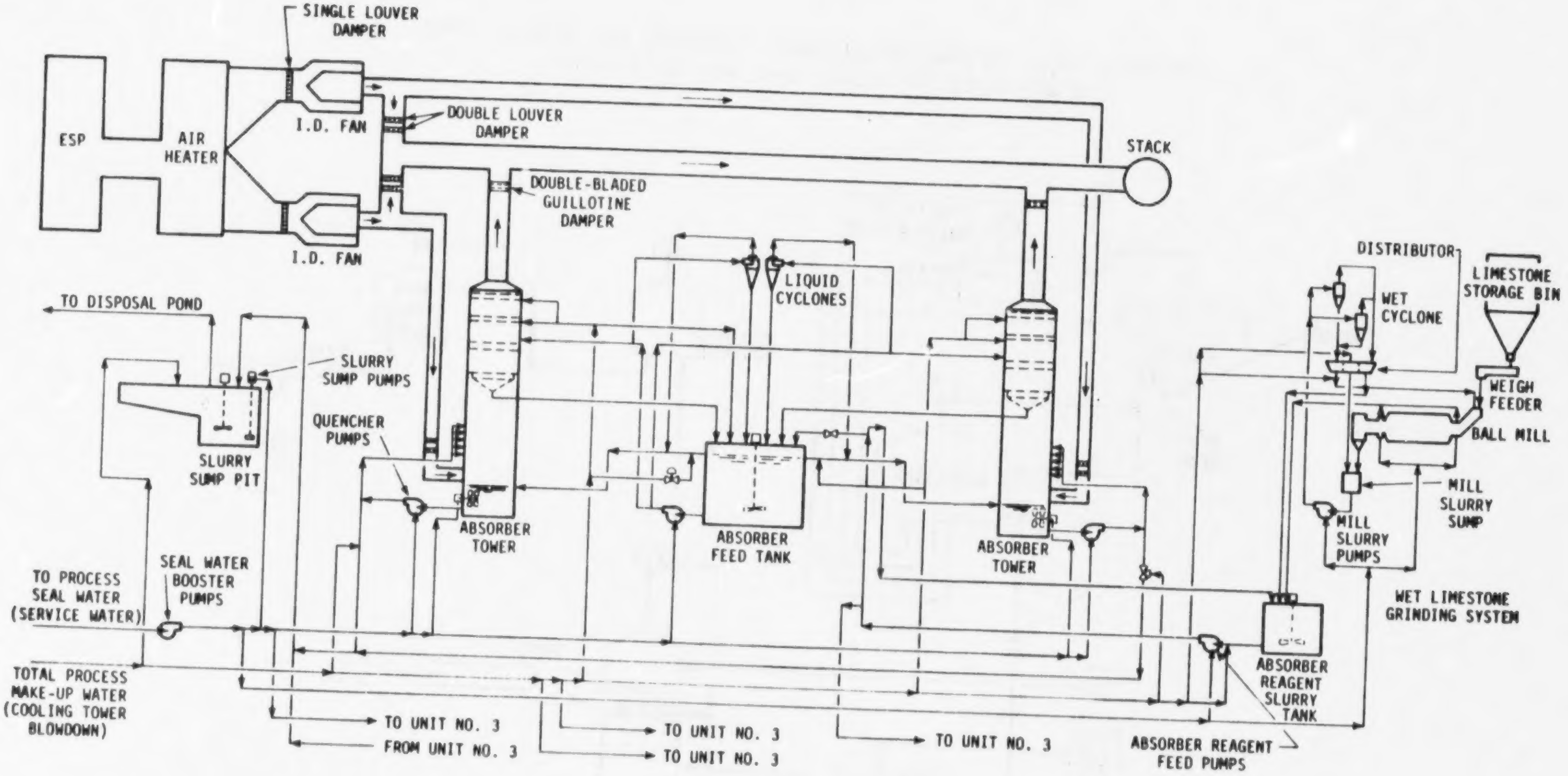
APPENDIX B

FGD PROCESS FLOW DIAGRAMS

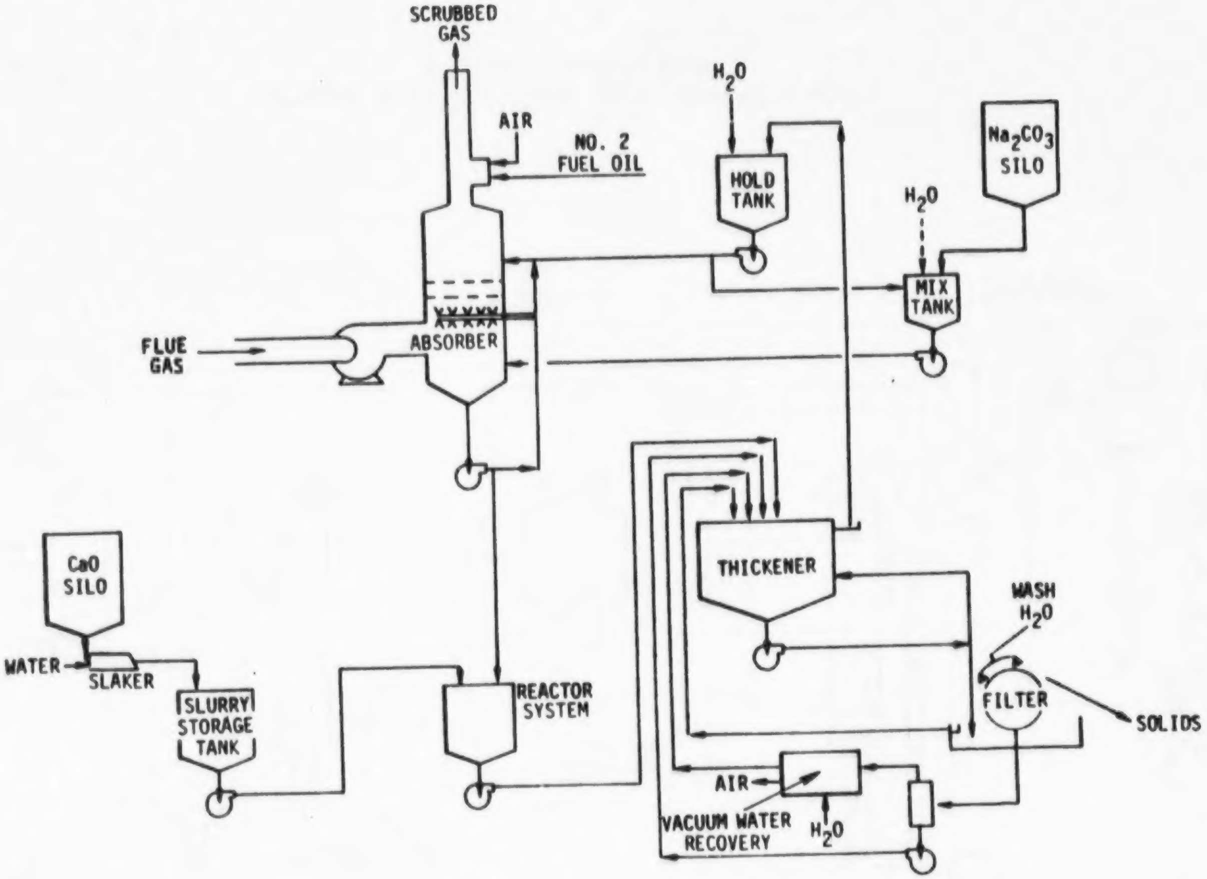
THIS APPENDIX COMPRISES OPERATING FGD SYSTEMS
ARRANGED ALPHABETICALLY ACCORDING TO UTILITY


FLUE GAS FROM BOILER (UNIT 2)
ESP
BOILER AIR PREHEATER
BOILER I.D. BOOSTER FANS
STACK
GAS TO STACK FROM UNIT 3
MAKEUP WATER (UNIT 2)
MAKEUP WATER (UNIT 3)
MIST ELIMINATOR
SPRAY TOWER ABSORBER
MIST ELIMINATOR
SPRAY TOWER ABSORBER
AGITATOR
WASH WATER TANK
WASH WATER PUMPS (THREE TOTAL)
HYDROCLONE
HYDROCLONE
LIMESTONE
LIMESTONE SILO
SLURRY CLASSIFIER
WEIGH FEEDER
BALL MILL
MILL RECYCLE SUMP
AGITATOR
LIMESTONE SLURRY STORAGE TANK
AGITATOR
SLURRY RECYCLE TANK
AGITATOR
LIMESTONE SLURRY TO UNIT 3
SUPERNATE TO UNIT 3
WASTE SLURRY FROM UNIT 3
SEAL WATER
SEAL WATER TO UNIT 3
MILL RECYCLE PUMPS (TWO TOTAL)
LIMESTONE SLURRY PUMPS (TWO TOTAL)
ABSORBER RECYCLE PUMPS (SIX PER UNIT)
WASTE SLURRY SUMP
WASTE SLURRY PUMPS (TWO TOTAL)
SCRUBBER WASTE STORAGE POND
SUPERNATE RETURN PUMP

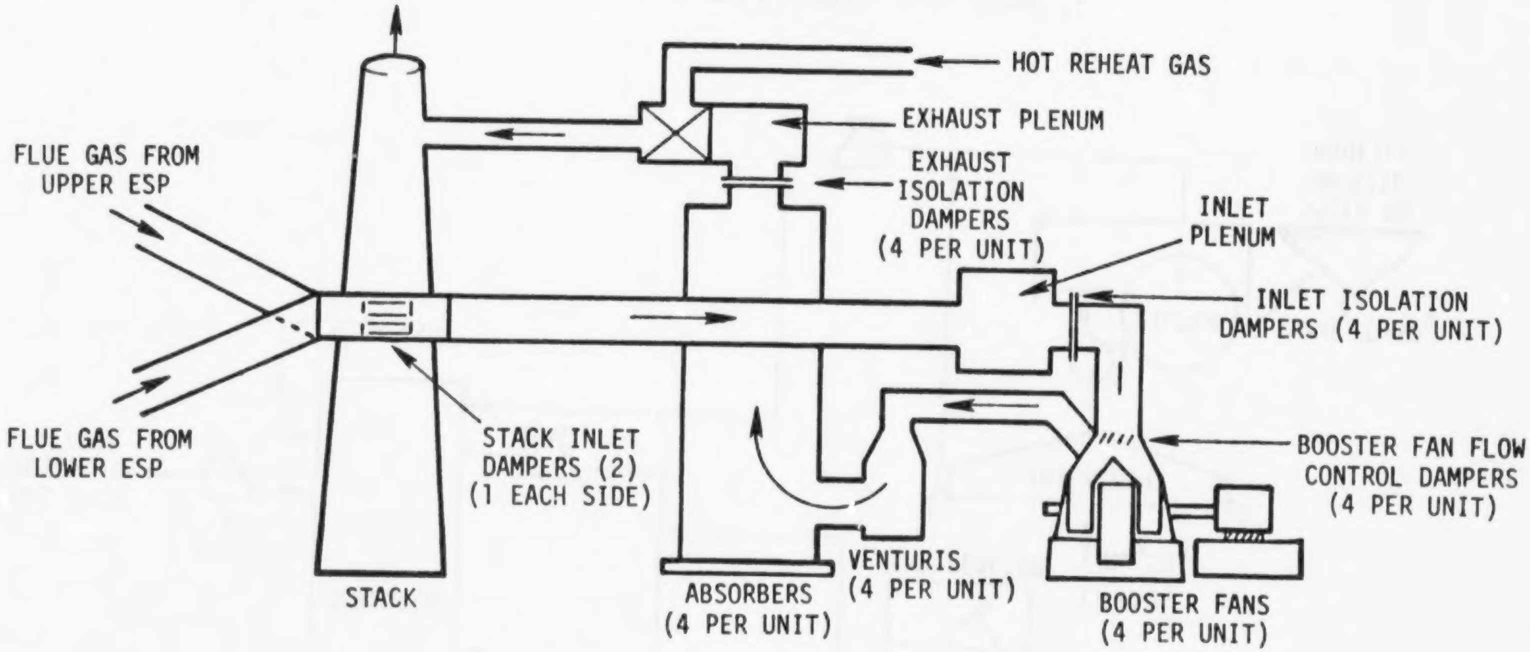
Alabama Electric,
Simplified Process Flow Diagram for Tombigbee 3


SINGLE LOUVER DAMPER
DOUBLE LOUVER DAMPER
ESP
AIR HEATER
I.D. FAN
I.D. FAN
STACK
DOUBLE-BLADED GUILLOTINE DAMPER
LIQUID CYCLONES
DISTRIBUTOR
LIMESTONE STORAGE BIN
WET CYCLONE
WEIGH FEEDER
BALL MILL
MILL SLURRY SUMP
MILL SLURRY PUMPS
WET LIMESTONE GRINDING SYSTEM
TO DISPOSAL POND
SLURRY SUMP PUMPS
SLURRY SUMP PIT
QUENCHER PUMPS
ABSORBER TOWER
ABSORBER FEED TANK
ABSORBER TOWER
ABSORBER REAGENT SLURRY TANK
TO PROCESS SEAL WATER (SERVICE WATER)
SEAL WATER BOOSTER PUMPS
TOTAL PROCESS MAKE-UP WATER (COOLING TOWER BLOWDOWN)
TO UNIT NO. 3
FROM UNIT NO. 3
TO UNIT NO. 3
TO UNIT NO. 3
TO UNIT NO. 3
ABSORBER REAGENT FEED PUMPS

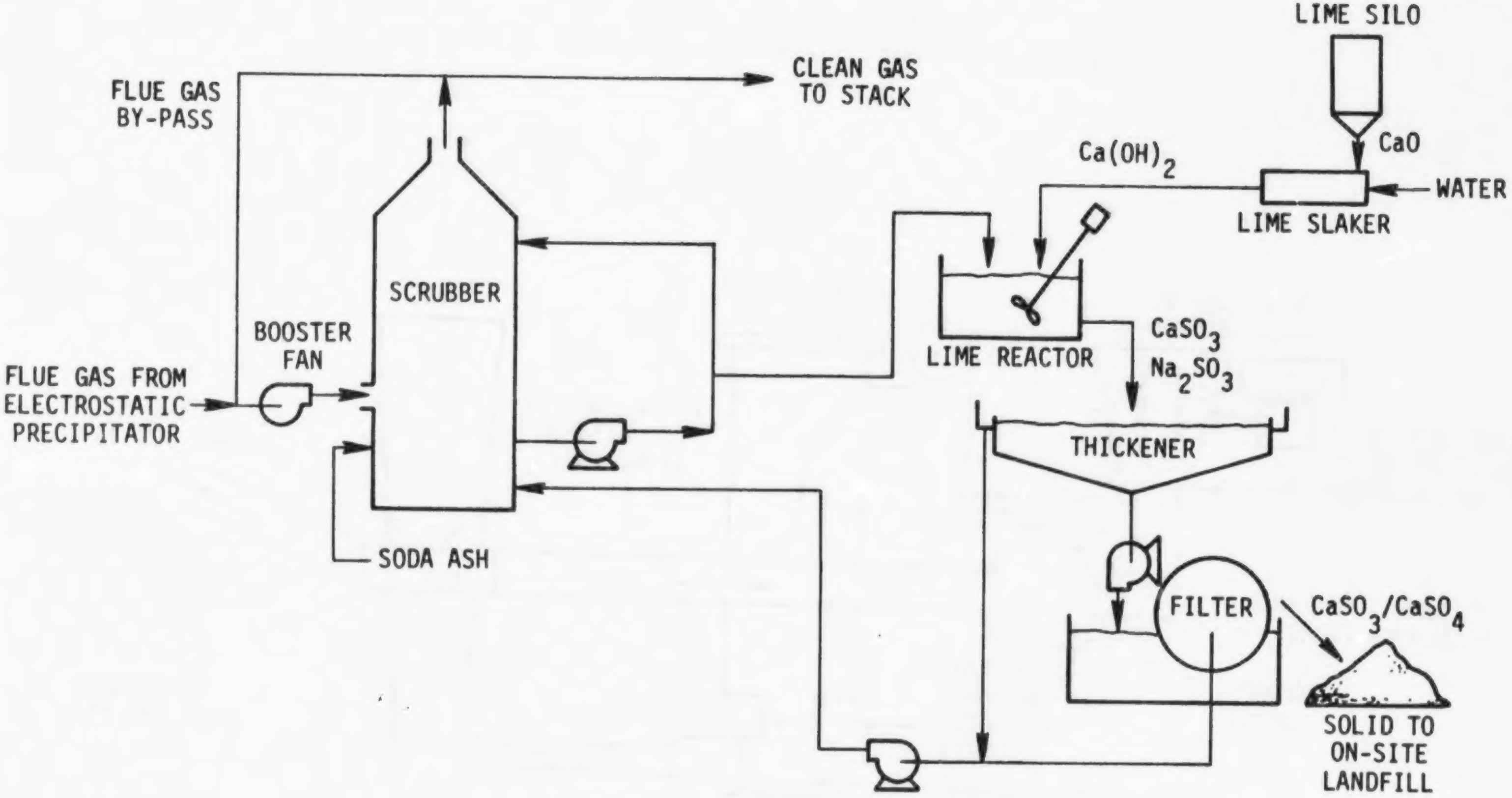
Arizona Electric Power Coop, Apache 2 and 3
Process Flow Diagram


SCRUBBED GAS
AIR
NO. 2 FUEL OIL
H_2O
HOLD TANK
Na_2CO_3 SILO
H_2O
MIX TANK
FLUE GAS
ABSORBER
THICKENER
WASH H_2O
CaO SILO
WATER
SLAKER
SLURRY STORAGE TANK
REACTOR SYSTEM
FILTER
SOLIDS
AIR
VACUUM WATER RECOVERY
H_2O

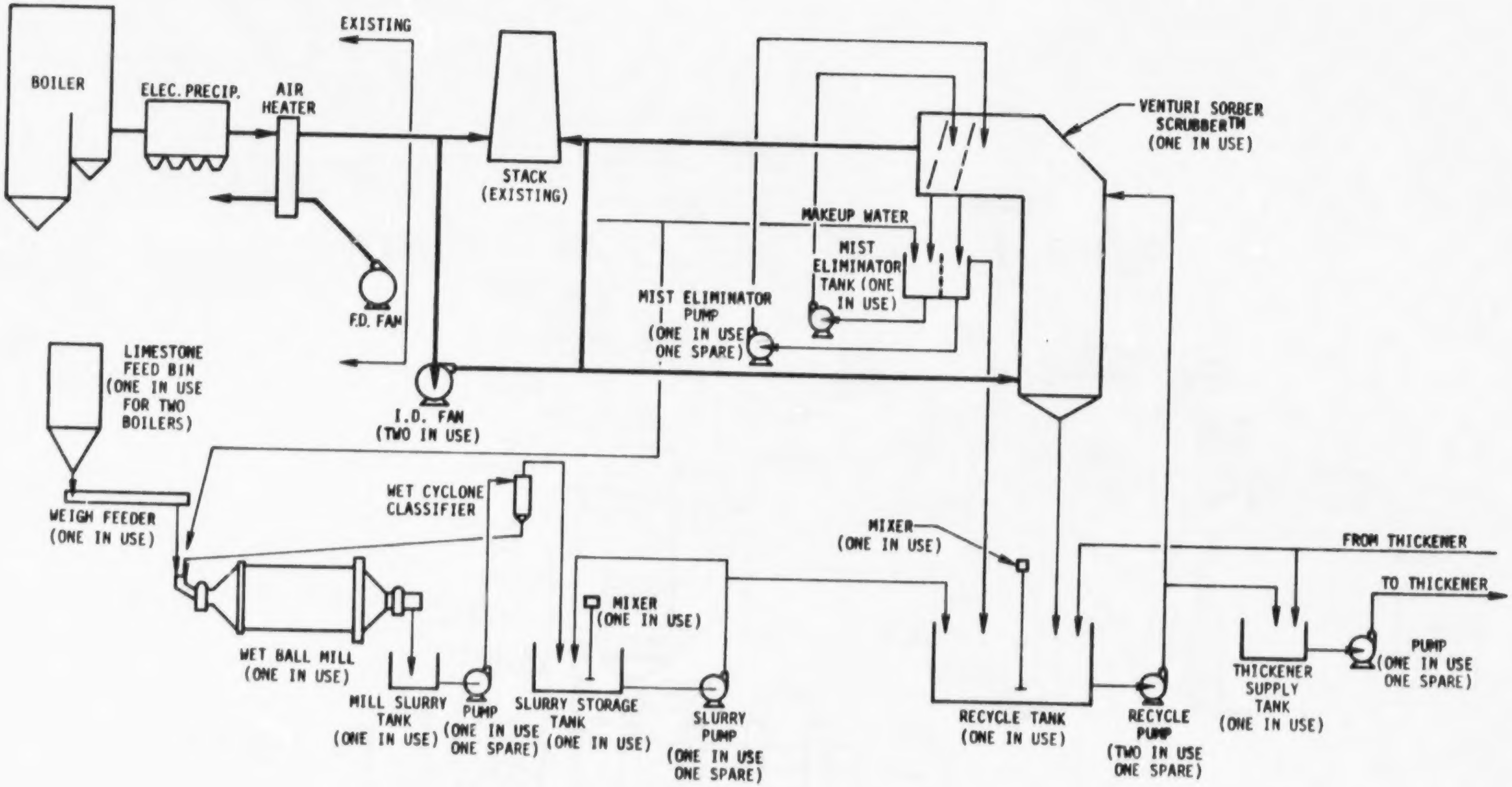
Louisville Gas and Electric, Cane Run 6
Dual Alkali FGD System: Simplified Process Flow Diagram


HOT REHEAT GAS
EXHAUST PLENUM
FLUE GAS FROM UPPER ESP
EXHAUST ISOLATION DAMPERS (4 PER UNIT)
INLET PLENUM
INLET ISOLATION DAMPERS (4 PER UNIT)
BOOSTER FAN FLOW CONTROL DAMPERS (4 PER UNIT)
FLUE GAS FROM LOWER ESP
STACK INLET DAMPERS (2) (1 EACH SIDE)
VENTURIS (4 PER UNIT)
STACK
ABSORBERS (4 PER UNIT)
BOOSTER FANS (4 PER UNIT)

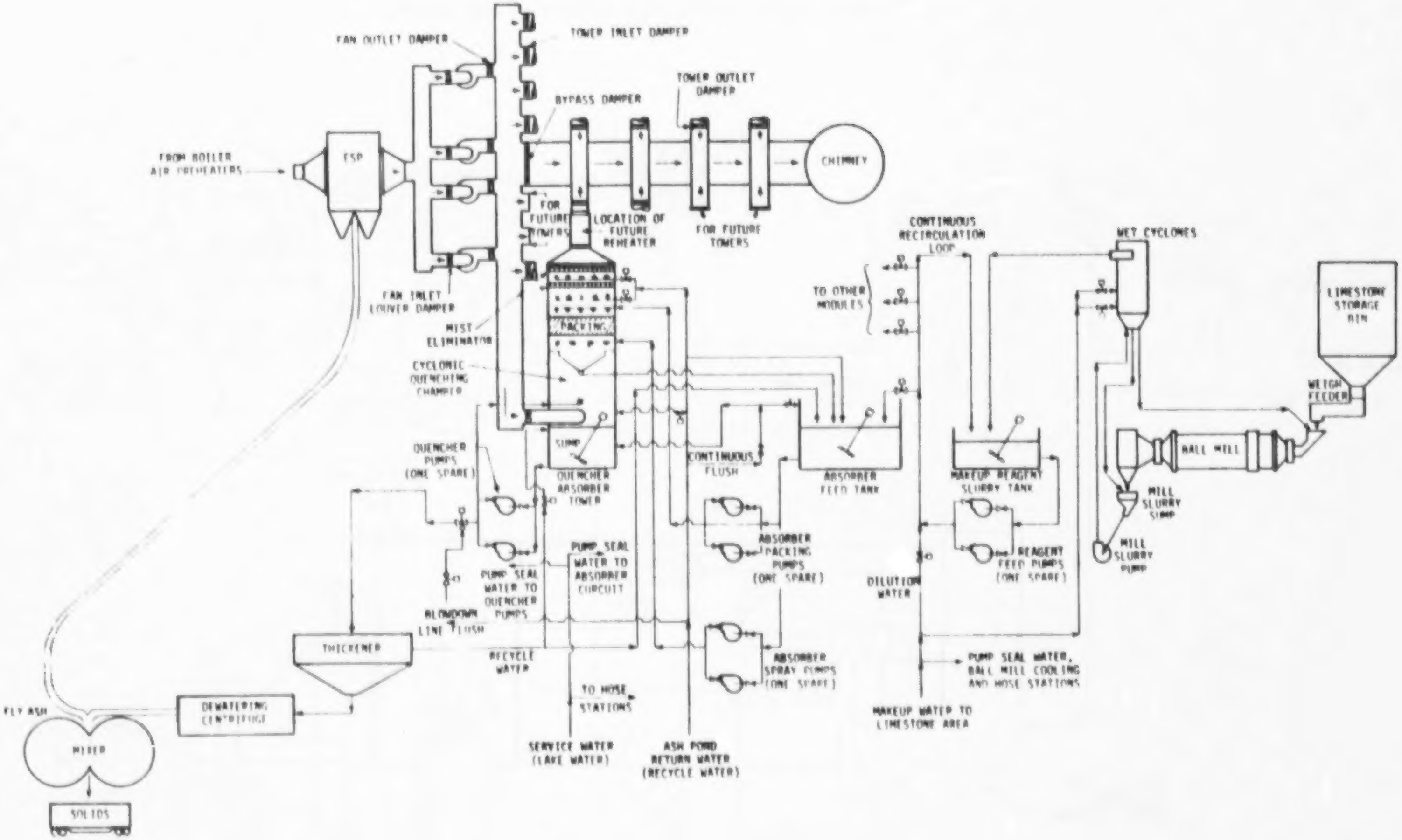
Public Service of New Mexico, San Juan 1 and 2
FGD System Flue Gas Flow Path


FLUE GAS BY-PASS
CLEAN GAS TO STACK
LIME SILO
CaO
WATER
LIME SLAKER
Ca(OH)$_2$
SCRUBBER
BOOSTER FAN
FLUE GAS FROM ELECTROSTATIC PRECIPITATOR
SODA ASH
LIME REACTOR
CaSO$_3$
Na$_2$SO$_3$
THICKENER
FILTER
CaSO$_3$/CaSO$_4$
SOLID TO ON-SITE LANDFILL

Southern Indiana Gas and Electric, A.B. Brown 1:
Dual Alkali FGD System: Simplified Process Flow Diagram


BOILER
ELEC. PRECIP.
AIR HEATER
EXISTING
F.D. FAN
STACK (EXISTING)
I.D. FAN (TWO IN USE)
VENTURI SORBER SCRUBBER™ (ONE IN USE)
MAKEUP WATER
MIST ELIMINATOR TANK (ONE IN USE)
MIST ELIMINATOR PUMP (ONE IN USE ONE SPARE)
LIMESTONE FEED BIN (ONE IN USE FOR TWO BOILERS)
WEIGH FEEDER (ONE IN USE)
WET CYCLONE CLASSIFIER
WET BALL MILL (ONE IN USE)
MILL SLURRY TANK (ONE IN USE)
PUMP (ONE IN USE ONE SPARE)
MIXER (ONE IN USE)
SLURRY STORAGE TANK (ONE IN USE)
SLURRY PUMP (ONE IN USE ONE SPARE)
MIXER (ONE IN USE)
RECYCLE TANK (ONE IN USE)
RECYCLE PUMP (TWO IN USE ONE SPARE)
FROM THICKENER
TO THICKENER
THICKENER SUPPLY TANK (ONE IN USE)
PUMP (ONE IN USE ONE SPARE)

South Mississippi Electric, R.D. Morrow 2:
Simplified Process Flow Diagram


FAN OUTLET DAMPER
TOWER INLET DAMPER
BYPASS DAMPER
TOWER OUTLET DAMPER
FROM BOILER AIR PREHEATERS
ESP
CHIMNEY
FOR FUTURE TOWERS
LOCATION OF FUTURE REHEATER
FOR FUTURE TOWERS
FAN INLET LOUVER DAMPER
MIST ELIMINATOR
PACKING
CYCLONIC QUENCHING CHAMBER
SUMP
QUENCHER ABSORBER TOWER
QUENCHER PUMPS (ONE SPARE)
PUMP SEAL WATER TO QUENCHER PUMPS
PUMP SEAL WATER TO ABSORBER CIRCUIT
BLOWDOWN LINE FLUSH
RECYCLE WATER
THICKENER
DEWATERING CENTRIFUGE
FLY ASH
MIXER
SOLIDS
TO HOSE STATIONS
SERVICE WATER (LAKE WATER)
ASH POND RETURN WATER (RECYCLE WATER)
CONTINUOUS FLUSH
ABSORBER PACKING PUMPS (ONE SPARE)
ABSORBER SPRAY PUMPS (ONE SPARE)
ABSORBER FEED TANK
TO OTHER MODULES
CONTINUOUS RECIRCULATION LOOP
DILUTION WATER
MAKEUP REAGENT SLURRY TANK
REAGENT FEED PUMPS (ONE SPARE)
PUMP SEAL WATER, BALL MILL COOLING AND HOSE STATIONS
MAKEUP WATER TO LIMESTONE AREA
WET CYCLONES
MILL SLURRY SUMP
MILL SLURRY PUMP
BALL MILL
WEIGH FEEDER
LIMESTONE STORAGE BIN

Texas Utilities,
Simplified Process Flow Diagram for One of the Three Identical
Martin Lake FGD Systems

APPENDIX C

DEFINITIONS

DEFINITIONS

Boiler Commercial Service Date	Date when boiler and auxiliary equipment (including FGD system for new boilers) has met initial supplier guarantees and begins to contribute electrical power to the power grid.
Byproduct	The nature (e.g. elemental sulfur, sulfuric acid) and disposition (e.g. stockpile on site, marketed) of the end product by systems that generate a saleable product.
Commercial Service Date (FGD System)	Date when the FGD system successfully completes compliance testing and the utility is satisfied that the system meets supplier contractual guarantees.
Company Name	Name of corporation as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - as space permits.
Disposal	Disposal method for throwaway product systems producing sludge including: stabilized or unstabilized sludge, interim and final disposal sites and disposal type (minefill, landfill, etc.) as well as disposal location.
Efficiency:	
Particulate Matter	The actual percentage of particulate matter removed by the emission control system (mechanical collectors, ESP, or fabric filter and FGD) from the untreated flue gas.
SO_2	The actual percentage of SO_2 removed from the flue gas by the FGD system.

FGD Viability Indexes

Several parameters have been developed to quantify the viability of FGD system technology. Various terms such as "availability," "reliability," "operability," and "utilization" are used to accurately represent the operation of any FGD system during a given period. The above-mentioned parameters are defined below and discussed briefly. The objectives of this discussion are to make the reader aware that several different definitions are being used and to select appropriate parameters that can be used for reporting purposes so that reasonably consistent comparisons can be made.

Availability Index

Hours the FGD system is available for operation (whether operated or not) divided by hours in period, expressed as a percentage. This parameter tends to overestimate the viability of the FGD system because it does not penalize for election not to operate the system when it could have been operated. Boiler downtime may tend to increase the magnitude of the parameter because FGD failures generally cannot occur during such periods.

Reliability Index

Hours the FGD system was operated divided by the hours the FGD system was called upon to operate, expressed as a percentage. This parameter has been developed in order not to penalize the FGD system for elected outages, e.g., periods when the FGD system could have been run but was not run because of chemical shortages, lack of manpower, short duration boiler operations, etc. The main problem in using this

	formula is the concise determination whether or not the system was "called upon to operate" during a given time period. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Operability Index	Hours the FGD system was operated divided by boiler operating hours in period, expressed as a percentage. This parameter indicates the degree to which the FGD system is actually used, relative to boiler operating time. The parameter is penalized when options are exercised not to use the FGD system in periods when the system is operable. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Utilization Index	Hours that the FGD system operated divided by total hours in period. This parameter is a relative stress factor for the FGD system. It is not a complete measure of FGD system viability because the parameter can be strongly influenced by conditions that are external to the FGD system (e.g., infrequent boiler operation will lower the value of the parameter although the FGD system may be highly dependable in its particular application).
End Product Saleable	The SO_2 removed from the flue gas is recovered in a usable or marketable form (e.g., sulfur, sulfuric acid, gypsum,

	ammonium sulfate, sodium sulfate).
Throwaway	The SO_2 removed from the flue gas is not recovered in a usable or marketable form and resulting sulfur-bearing waste products must be disposed in an environmentally acceptable fashion.
Energy Consumption, %	The percentage of gross unit electrical generating capacity consumed by the FGD system, as defined by the following equation: [Net MW w/o FGD - Net MW w/FGD]/ Gross unit rating]
Equivalent Scrubbed Capacity (ESC)	The effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system.
FGD Status:	
Category 1	Operational - FGD system is in service removing SO_2.
Category 2	Under construction - ground has been broken for installation of FGD system, but FGD system has not become operational.
Category 3	Planned, Contract Awarded - contract has been signed for purchase of FGD system but ground has not been broken for installation.
Cateogry 4	Planned, Letter of Intent Signed - letter of intent has been signed, but legal contract for purchase has not been awarded.
Category 5	Planned, Requesting/Evaluating Bids - bid requests have been released but no letter of intent or contract has been issued.

Category 6	Considering only FGD Systems - an FGD system is proposed as a means to meet an SO_2 regulation.
Category 7	Considering an FGD system as well as alternative methods.
Category 8	Nonoperational - FGD system has been operated in the past but has been shut down permanently or for an extended indefinite period of time.
Fuel Firing Rate - TPH	Boiler fuel firing rate in terms of tons per hour at maximum continuous load.
General Process Type	The manner in which the SO_2 from the flue gas is collected, e.g., wet scrubbing, spray drying, dry adsorption.
Initial Start-Up (FGD System)	Date when flue gas first passes through any component of the FGD system (or is scheduled to do so).
New	FGD unit and boiler were designed at the same time or space for addition of an FGD unit was reserved when boiler was constructed.
Plant Name	Unit identification as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - or as indicated by utility representative for installations in planning stages.
Process Additives	A chemical compound or element which is added to the process or normally found with the main process reagent in small quantities (e.g., Mg, adipic acid) to promote improved process operation (e.g., scale reduction, increased SO_2 removal efficiency).

Process Type	Company name if process is patented. Generic name if several companies have similar processes (e.g., Lime, Limestone, Wellman Lord, Thoroughbred 121).
Regulatory Class	A. New boiler constructed subject to Federal New Source Performance Standards (NSPS), 8/17/71. B. Existing boiler subject to State Standard that is more stringent than the NSPS, 8/17/71. C. Existing boiler subject to State Standard that is equal to or less stringent than NSPS, 8/17/71. D. Other (unknown, undetermined).
Retrofit	FGD unit will be/was added to an existing boiler not specifically designed to accommodate FGD unit.
Spare Capacity Index - %	The summation of the individual component capacities (%) minus 100%.
Spare Component Index	The equipment spare capacity index (%) divided by the individual component capacity (%).
System Supplier	A firm that fabricates and supplies flue gas desulfurization systems.
Total Controlled Capacity (TCC)	The gross rating (MW) of a unit brought into compliance with FGD, regardless of the percent of flue gas treated at the facility. In the case of prototype and demonstration FGD systems, this figure will be identical to the Equivalent Scrubbed Capacity rather than

	the gross unit rating if the system is not meant to bring the facility into compliance with SO_2 emission standards.
Unit Rating	
Gross	Operational - Maximum continuous gross generation capacity in MW; Preoperational - maximum continuous design generation capacity in MW.
New w/FGD	Gross unit rating less the energy required to operate ancillary station equipment, inclusive of emission control systems.
Net w/o FGD	Gross unit rating less the energy required to operate ancillary station equipment, exclusive of emission control systems.

APPENDIX D

TABLE OF UNIT NOTATION

TABLE OF UNIT NOTATION

Classification	English Unit	Symbol	Survey Report Notation	ASTM/SI Unit	Symbol	Survey Report Notation
Area	Acre	acre	ACRE	Square meter	M^2	SQ.M
	Square foot	ft^2	SQ.FT	Square meter	M^2	SQ.M
Concentration	Grains per standard cubic foot	gr/scf	GR/SCF	Grams per cubic meter	g/m^3	G/CU.M
	Parts per million	ppm	PPM	Parts per million	ppm	PPM
	Pounds per million Btu	$lb/10^6$ Btu	LB/MMBTU	Nanograms per joule	ng/J	NG/J
Flow	Actual cubic feet per minute	ft^3/min (actual)	ACFM	Cubic meters per second	m^3/s	CU.M/S
	Gallons per minute	gal/min	GPM	Liters per second	liter/s	LITER/S
	Pounds per minute	lb/min	LB/MIN	Kilogram per second	kg/s	KG/S
	Ton per day	t/day	TPD	Metric ton per day	M t/d	M T/D
	Ton per hour	t/h	TPH	Metric ton per hour	M t/h	M T/H
Heat Content	Btu per pound	Btu/lb	BTU/LB	Joules per gram	J/g	J/G
Length	Foot	ft	FT	Meter	m	M
	Inch	in	IN	Centimeter	cm	CM
	Mile	mi	MI	Kilometer	km	KM
L/G Ratio	Gallons per thousand actual cubic feet	gal/1000 ft^3 (actual)	GAL/1000ACF	Liters per cubic meter	$liter/m^3$	LITER/CU.M
Mass/Weight	Pound	lb	LB	Kilogram	kg	KG
	Ton	t	T	Megagram	Mg	MG
Pressure	Inches of water	in. H_2O	IN. H_2O	Kilopascal	kPa	KPA
Temperature	Degree Fahrenheit	°F	F	Degree Celsius	°C	C
Volume	Cubic feet	ft^3	CU.F	Cubic meter	m^3	CU.M
	Acre-feet	Acre-ft	ACRE-FT	Cubic meter	m^3	CU.M